RCS20

M:N Redundancy Switch

Installation and Operation Manual

TM056

Rev. 2.3

- NOTICE -

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Preface

This manual provides installation and operation information for the Radyne ComStream, Inc. RCS20 M:N Redundancy Switch. This is a technical document intended for use by engineers, technicians, and operators responsible for the operation and maintenance of the RCS20.

Conventions

Whenever the information within this manual instructs the operator to press a pushbutton switch or keypad key on the RCS20 Switch Front Panel, the pushbutton or key label will be shown enclosed in "less than" (<) and "greater than" (>) brackets. For example, the Reset Alarms Pushbutton will be shown as <RESET ALARMS>, while a command that calls for the entry of a '7' followed by 'ENTER' Key will be represented as <7,ENTER>.

Cautions and Warnings

A caution icon indicates a hazardous situation that if not avoided, may result in minor or moderate injury. Caution may also be used to indicate other unsafe practices or risks of property damage.

A warning icon indicates a potentially hazardous situation that if not avoided, could result in death or serious injury.

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Record of Revisions

Revision Level	Date	Reason for Change
1	6-30-96	Initial Release
1.1	9-12-96	Added cabling and interconnection drawing, added breakout panels drawing, Added menu trees and configurable parameters.
1.2	12-06-96	Added DIP switch settings, added new J no's to Fig. 2-1, minor clarifications
2.0	1-10-97	Added Remote Communications specification, operator front panel screens, enhanced operations section, added illustrations.
2.1	4-26-97	Major Revisions throughout
2.2	8-8-02	Revised and reformatted Technical Manual.
2.3	8-25-03	Revised Remote RLLP (Appendix A) Opcode 2202h.

Comments or Suggestions Concerning this Manual

Comments or suggestions regarding the content and design of this manual are appreciated. To submit comments, please contact the Radyne ComStream, Inc. Customer Service Department.

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Glossary

Section 1 – Introduction

1.0 Description

The Radyne ComStream, Inc. RCS20 M:N Redundancy Switch provides backup switching/protection for up to nine pairs of satellite modem channels (modulators/demodulators). The RCS20 is a companion product to the Radyne DMD15/2400 family of Satellite Modems.

The RCS20 is comprised of three separate units that make up the switching system; the Redundancy Control Unit (RCU20), the Digital Data Switch (DDS20) and the Intermediate Frequency Switch (IFS20).

The RCS20 can be operated automatically, in which case an automatic backup of a failed online modem occurs after a preprogrammed delay. The switch may also be operated manually, allowing the operator to manually switch to a backup modem. Front panel controls and indicators provide for auto/manual configuration, as well as display of online/off line status information for all modems in the redundancy configuration.

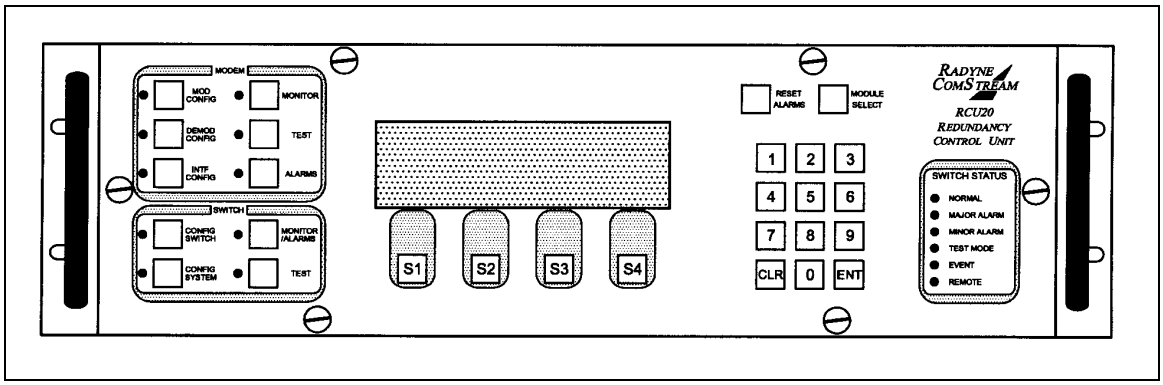


Figure 1. RCS20 M:N Redundancy Switch

1.1 Digital Data Switch (DDS20)

The DDS20 provides all of the data interconnections between the online and backup modems. The DDS20 also provides buffering of terrestrial data signals to backup modulators allowing 'hot-standby' modes of operation. The DDS20 receives control and DC power through an interconnecting cable from the RCU20.

1.2 Intermediate Frequency Switch (IFS20)

The IFS20 Intermediate Frequency Switch interfaces the IF signals of the modems with the Earth Station IF system and provides backup switching. The unit provides all of the switching relays, signal splitters and terminations that are necessary to connect any combination of up to nine Modulators and Demodulators to nine independent uplink and nine independent downlink transponders. The IFS20 receives control and DC power through an interconnecting cable from the RCU20.

1.3 General Information

Every attempt has been made to include all of the information that is necessary to properly operate the RCS20. However, although basic information is included on theory of operation and

troubleshooting, this is not a service or maintenance manual. Also, the user should be fully familiar with the operation of the individual Satellite Modems, Modulators and/or Demodulators that will be connected to the Switch. Throughout this manual any reference to the RCS20 indicates the combination of the RCU20, IFS20 and the DDS20. Refer to Figure 1-1 for a pictorial representation of the RCU20 front panel, Figure 1-2 for a Functional Block Diagram of the RCS20 System and Figure 2-7 for an interconnection diagram of the complete system including the cabling requirements.

1.4 Channel Definitions

The RCS20 organizes the modems connected to the switch according to satellite communications channels. These channels are labeled on the DDS20 and IFS20 panels, and are defined as follows:

Channel 0 - Backup 1
Channel 1 - Modem 1
Channel 2 - Modem 2
Channel 3 - Modem 3
Channel 4 - Modem 4
Channel 5 - Modem 5
Channel 6 - Modem 6
Channel 7 - Modem 7
Channel 8 - Modem 8
Channel 9 - Modem 9/Backup 2

Section 2 – Installation

2.0 Installation Requirements

This chapter instructs the user in the methods for setting up and installing an RCS20 M:N Redundancy Switch into a Satellite Modem system. The cabling configurations for up to nine channels and nine transponders are described.

2.1 Unpacking the System

Unseal the shipping cartons taking care not to damage the cartons, the packing material or the equipment inside. The cartons and the packing material should be saved in the event that an RCS20 will need to be reshipped. Examine the exterior of the units for any possible shipping damage.

2.1.1 List of Items

Carefully remove the units from the cartons. In addition to this manual, verify that the following items are present:

- RCS20 Redundancy Control Unit
- IFS20 or IFS20A Intermediate Frequency Switch
- 2 ea. AC Power Cords
- 2 ea. Bank Control 15-pin HD Sub Cables
- M:N Switch System Test Data Sheet
- M:N Switch to Modem Cable(s) for Backup Modulator and Demodulator
- Test I/O Mating Connector
- Optional 1:N Switch to Modem, I/O and Coaxial Cables for Modems 1 – 9
- Optional Modem bypass cable(s) for Modems 1 – 9

2.1.2 In Case of Shipping Damage

If any shipping damage is discovered to any of the above listed equipment, promptly contact the transporter and file a damage claim. The transporter is responsible for any damage caused during shipping. Radyne, Inc. should also be contacted.

Damage as a result of transport is not covered under the Radyne, Inc. Warranty. Refer to the Warranty section in the front of this manual for further information.

The procedure for returning faulty or damaged equipment is contained in the warranty section in the front of this manual.

2.1.3 Test Data Sheet

Each RCS20 M:N Redundancy Switch system is shipped with a Test Data Sheet. This report contains information on the results of the Switch quality control testing. The report also includes information pertaining to the system settings that were made at the factory. Radyne, Inc. recommends that the user save this report for future reference.

2.2 Site Considerations

Adequate site planning and preparation simplifies the installation process and results in a more reliable system. The user should ensure that the site has adequate electrical power, environmental controls and protection against sources of electrical radiation and interference.

2.2.1 Power Sources

The power sources should be properly grounded and as free as possible from electrical interference. If a redundant configuration is to be used, then each power cord on the RCS20 must be plugged into its own separate power circuit. Each circuit must have its own independent circuit breaker.

Grounding is achieved automatically when the three-prong power plug is inserted into a power receptacle. Verify by testing that there is no voltage present between the chassis of the Switch and the power line ground.

The protective ground must not be bypassed with a three prong to two-prong adapter or defeated in any way. Defeating the ground may result in operator injury or damage to the system.

2.3 Rack Mounting

The RCS20 is designed so that it can be mounted in a standard 19-inch rack. The RCS20 is 5¼", 3 Rack Units (RU) high and must be mounted on the front of a rack with the front panel facing forward as shown in Figure 1-1.

The DDS20 is 8¾" (5 RU) high and is preferably mounted at the top of a rack unit with the Terrestrial Interface connectors available at the top of the rack and the modem connections available at the at the bottom of the DDU20 in the interior of the rack. The DDS20 may also be mounted at the rear of a rack with the Terrestrial Interface connectors available at the rear of the rack and the modem connections available in the interior of the rack.

The IFS20A is also 8¾" (5 RU) high and is designed to be mounted at the rear of a rack with the Up/Downconverter interface connections facing to the rear of the rack with the modem IF connections available in the interior of the rack. The IFS20A may also be mounted in the top of a rack with the Up/Downconverter interface connections available at the top of the rack and the modem IF connections available inside the rack.

To allow for the easy installation of cables and adequate air circulation through the units, a minimum of six of clearance must be provided at the sides and rear of the units. In addition, the RCS20 requires a minimum of 1¾" (1 RU) of clearance on top of the unit.
If the Switch is mounted on slide mounts, the cables must be of sufficient length to allow the units to be pulled forward on the mounts.

2.4 System Cable Configuration

This section describes the cabling configurations for the various combinations of DMD15/2400 Modulators/Demodulators/Modems and Transponders. The following figures are provided to illustrate the proper placement of the cables:

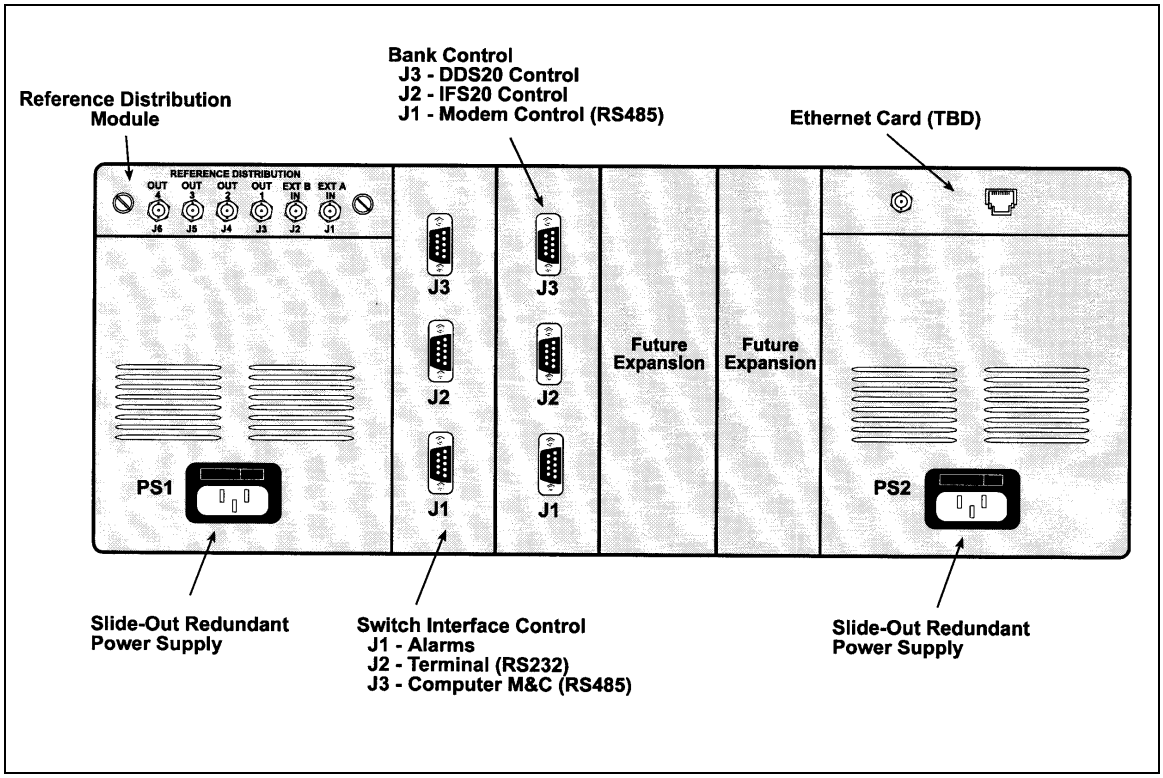


Figure 2-1. RCU20 Rear Panel

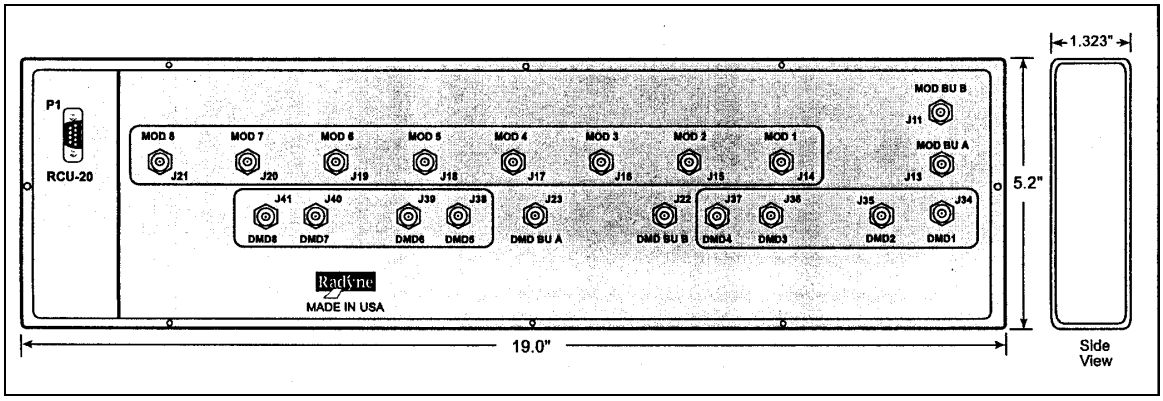


Figure 2-2. IFS20 Rear Panel

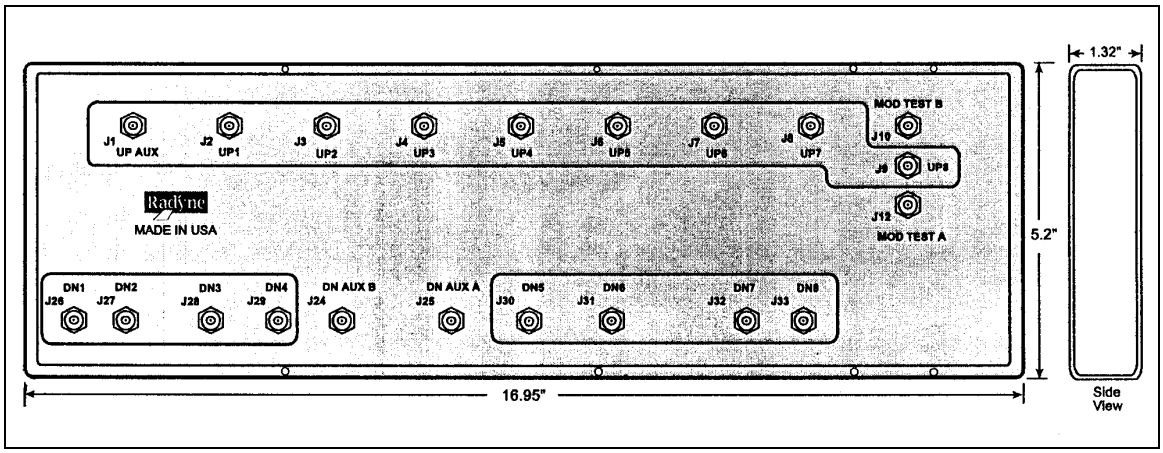


Figure 2-3. IFS20 Chassis Base Unit Rear Available Connectors

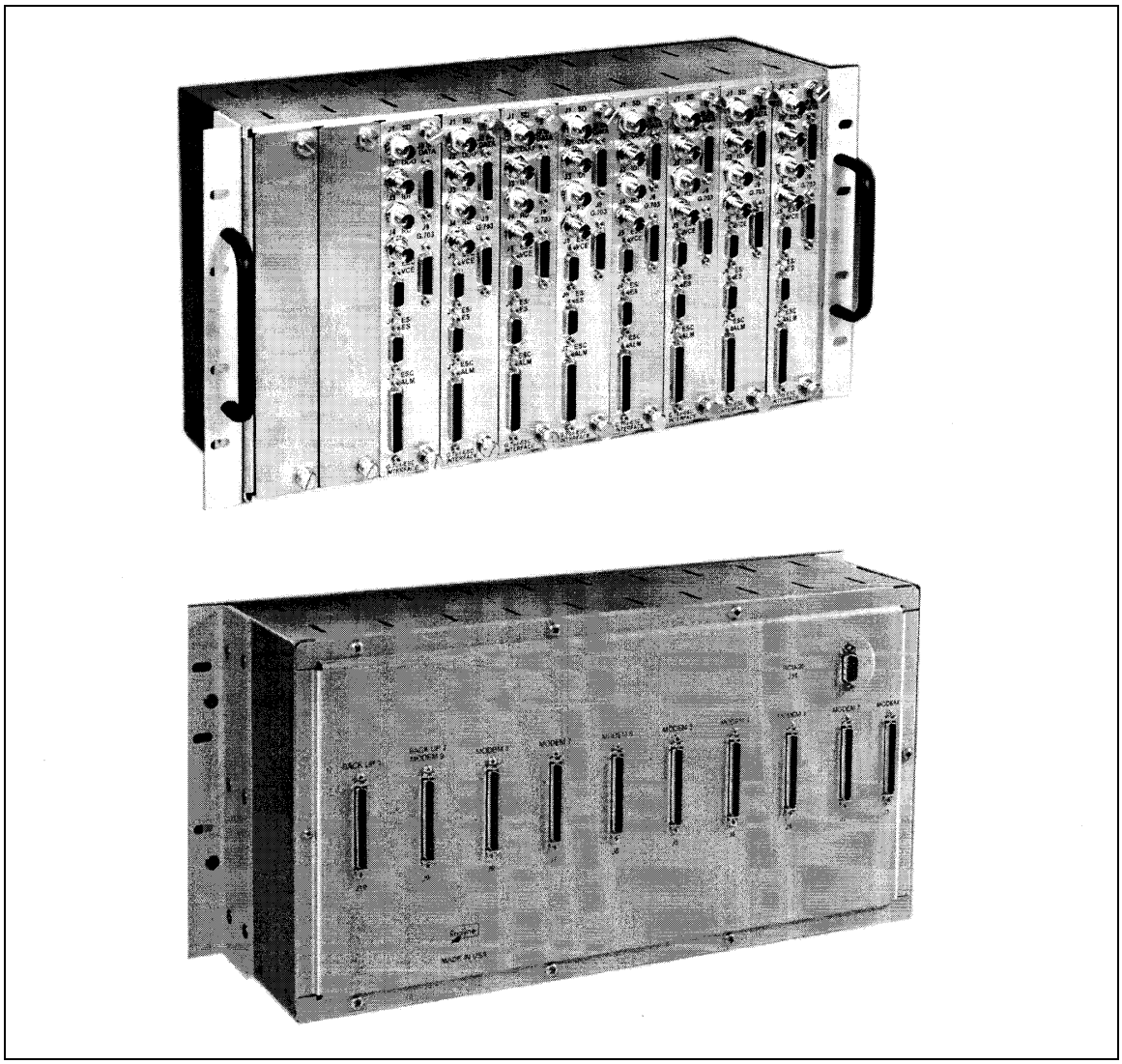


Figure 2-4. DDS20 Digital Data Switch Front and Rear Panels

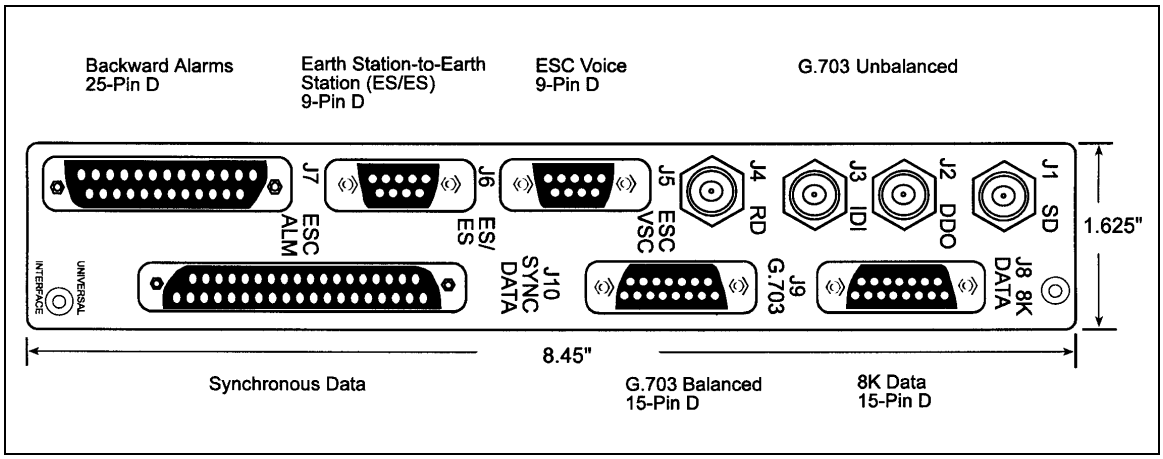


Figure 2-5. DDS20 Rear Panel Interface – Data Switch Module

WARNING!!

If either AC line cord remains connected to the RCS20, dangerous AC voltages will be present within the Switch and the cooling fan will also be operational. The top cover of the Switch should not be removed unless one of the power supplies is to be replaced following the Instructions in Section 4.

Although AC power is not present on the back plane, care must be taken when Installing or removing a plug-in module since DC voltages will be present.

The IFS20 and DDS20 receive DC power through the RCS20 interconnection cable. Therefore, to ensure that no DC power is being applied to the back plane modules, both of the Switch's AC line cords or the RCS20 interconnection cable must be removed.

2.5 System DIP Switch and Jumper Settings

The RCS20 requires several DIP Switches and jumpers to be configured for proper operation. The DIP Switches are located on the Digital Data Switches (DDS20) and the jumpers are located on the optional Reference Distribution Module on the RCU20 (See Figure 2-8).

2.5.1 Data Switch Module DIP Switch Configuration

Two Part Numbers exist for Data Switch Modules on the DDS20; AS/3356 (Figure 2-6a) and AS/3478 (Figure 2-6b and 2-6c for **AS/3478 Rev. A2 forward only**).

The AS/3356 Modules were shipped with older models of the DDS20. Refer to Tables 2-1 through 2-5 for the various DIP Switch configurations on these assemblies.

Table 2-1.
AS/3356 G.703 Unbalanced DIP Switch Settings

1	ON Tx DDI
2	ON Tx DDI
3	ON Rx IDO
4	ON Rx IDO
5	ON Rx DDO
6	ON Rx DDO
7	ON Tx IDI
8	ON Tx IDI
9	ON Tx DDI
10	ON Tx IDI

Table 2-2.
AS/3356 G.703 Balanced DIP Switch Settings

1	ON
2	ON
3	OFF
4	OFF
5	OFF
6	OFF
7	ON
8	ON
9	OFF
10	OFF

Table 2-3.
AS/3356 ALL SYNC (RS422/V.35) DIP Switch Settings

1	OFF
2	OFF
3	OFF
4	OFF
5	OFF
6	OFF
7	OFF
8	OFF
9	OFF
10	OFF

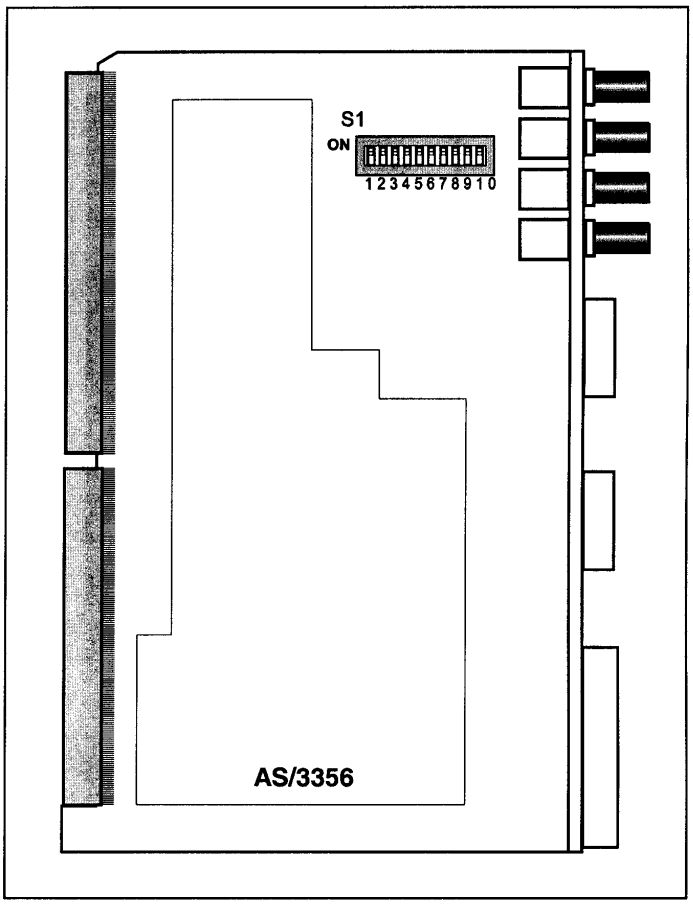


Figure 2-6a. AS/3356 Data Switch Module

Table 2-4.
AS/3478 G.703 Unbalanced DIP Switch Settings

1	ON Rx (IDO)
2	ON Rx (IDO)
3	ON Rx (DDO)
4	ON Rx (DDO)
5	ON Tx (DDI)
6	ON Tx (IDI)

Table 2-5.
AS/3478 G.703 Balanced DIP Switch Settings

1	OFF
2	OFF
3	OFF
4	OFF
5	OFF
6	OFF

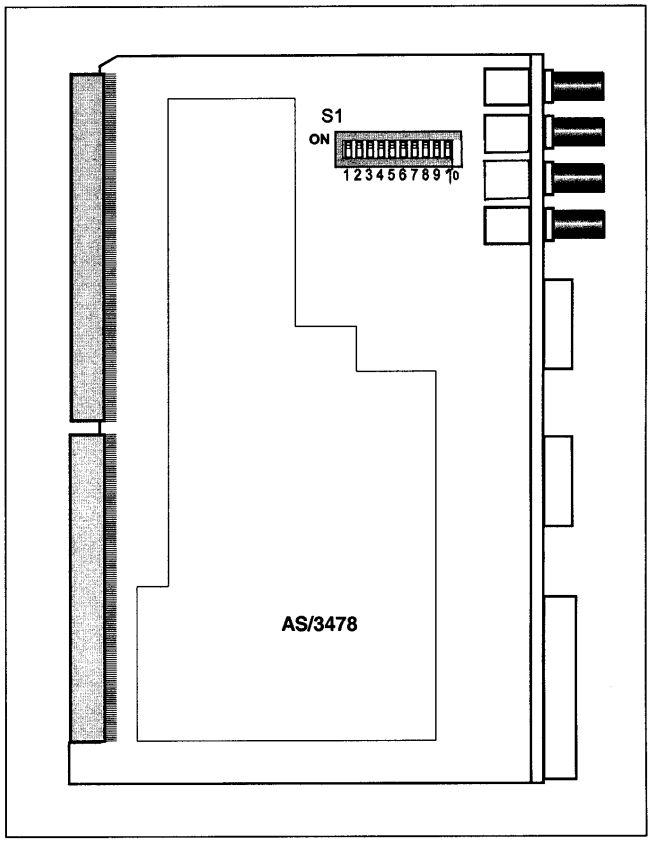


Figure 2-6b. AS/3356 Data Switch Module

Table 2-4. AS/3478 G.703 Unbalanced DIP Switch Settings	
1	ON
2	ON
3	ON
4	ON
5	ON
6	ON
7	OFF
8	OFF

Table 2-5. AS/3478 G.703 Balanced DIP Switch Settings	
1	OFF
2	OFF
3	OFF
4	OFF
5	OFF
6	OFF
7	OFF
8	OFF

Table 2-5a. AS/3478 RS-422/V.35 DIP Switch Settings	
1	OFF
2	OFF
3	OFF
4	OFF
5	OFF
6	OFF
7	ON
8	ON

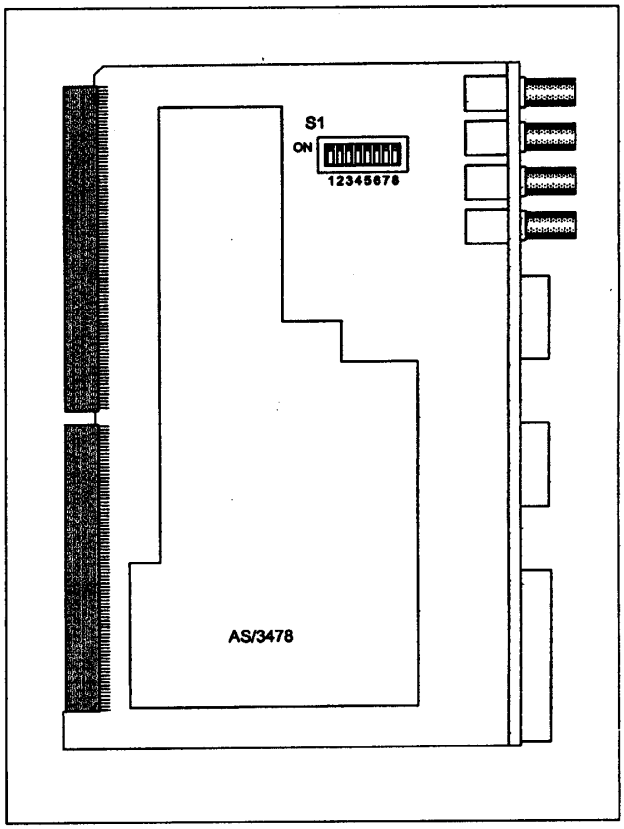


Figure 2-6c. AS/3356 Data Switch Module (for AS/3478 Rev. A2 Forward Only)

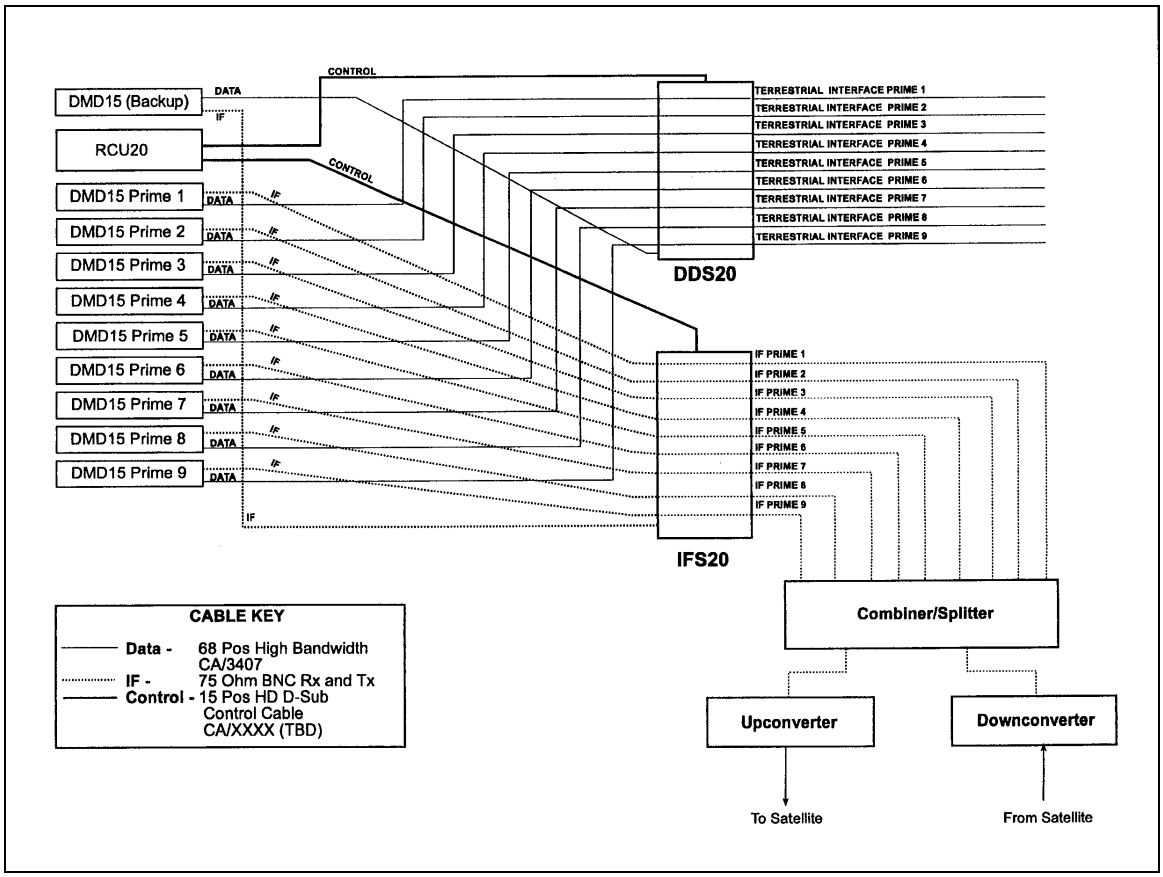


Figure 2-7. Complete System Interconnection and Cabling Information for System Configuration

2.5.2 Reference Distribution Module

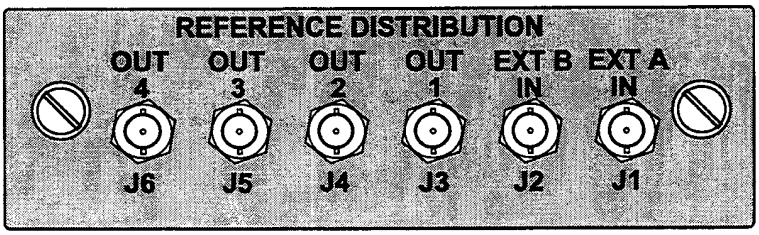
The Reference Distribution Module (RDM) is an optional RCU20 expansion card that is used to buffer and distribute earth station frequency reference(s) to the external reference input of modems that are connected to an RCS20. The RDM automatically switches between EXT A, EXT B or Internal References based upon onboard Clock Activity Detect circuits.

The RDM is illustrated in Figure 2-8. There are six BNC-type connectors on the RDM. The function of the individual connectors is as follows:

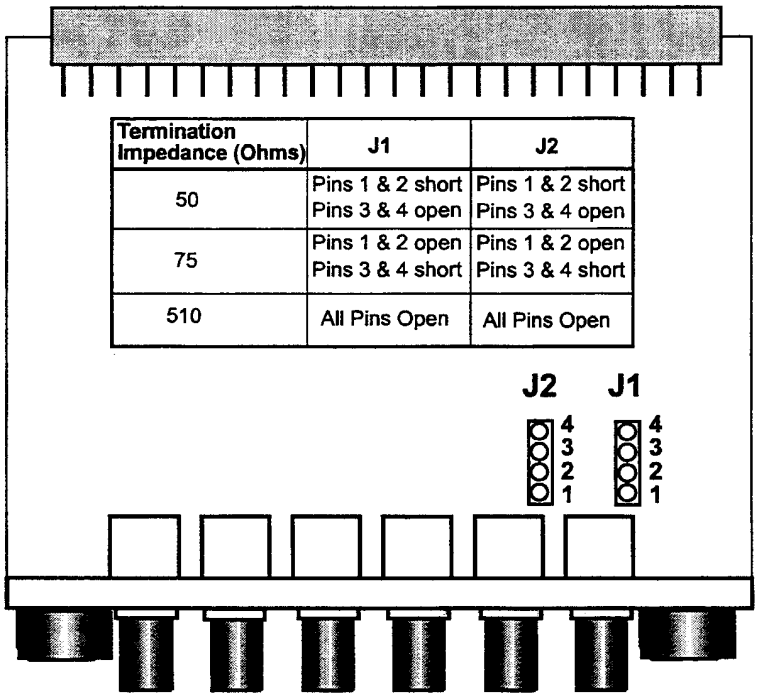
J1	EXTA IN	Primary Internal Reference Input
J2	EXTB IN	Secondary Internal Reference Input
J3	OUT 1	Reference Output 1
J4	OUT 2	Reference Output 2
J5	OUT 3	Reference Output 3
J6	OUT 4	Reference Output 4

The RDM also contains an internal reference in two options; High-stability or normal. These options and the electrical specifications for the above connectors are shown below.

Front View



Note: The Reference Distribution Module must be configured with 2 jumpers to select the termination impedance. The jumpers are J1 and J2 shown below. Set the jumpers according to the table shown in the illustration below.



Termination Impedance (Ohms)	J1	J2
50	Pins 1 & 2 short Pins 3 & 4 open	Pins 1 & 2 short Pins 3 & 4 open
75	Pins 1 & 2 open Pins 3 & 4 short	Pins 1 & 2 open Pins 3 & 4 short
510	All Pins Open	All Pins Open

Top View

Figure 2-8. RCU Reference Distribution Module Jumper Settings

External Input A (EXT A)

Impedance:	50, 75, 510O (Jumper-Selectable)
Frequency:	1.25, 2.5, 5.0 and 10.0 MHz
Input Level Spec.:	High Level 2 to 5 Volts

Low Level 0 to 0.8 Volts

External Input B (EXT B)

Impedance:	50, 75, 510O (Jumper-Selectable)
Frequency:	1.25, 2.5, 5.0 and 10.0 MHz
Input Level Spec.:	High Level 2 to 5 Volts Low Level 0 to 0.8 Volts

Internal Reference (Option 1)

Stability:	1×10^{-5}
Output Frequency:	1.25, 2.5, 5.0 and 10.0 MHz (Program-selectable to match External Input)

Internal Reference (Option 2)

Stability:	1×10^{-8}
Aging (day):	1×10^{-8}
Aging (year):	1×10^{-8}
Output Frequency:	1.25, 2.5, 5.0 and 10.0 MHz (Program-selectable to match External Input)

Microprocessor Interface

External 1/ External 2/ Internal Reference Select
External Input Activity Detectors
Internal Reference Activity Detector

Reference Output (OUT1, OUT2, OUT3, OUT4)

Output Level:	TTL	
Output Current Drive:	48 mA Maximum	
	Sufficient to drive 5:	DMD15
		DVB3000
		DMD2401
	Sufficient to drive 3:	DMD2400
Output Frequency:	Same as External Input	
Output Impedance:	50O	
Short Circuit Resistant		

Board Outline

RCS20 Option Card Slot/DIN Connector

2.6 DDS20 Connector Pinouts

The following connectors are located on the Universal Interface Module on the DDS20. Refer to the following Tables for the connector pinouts.

2.6.1 J1 - SD - Send Data

J1 is the G.703 Unbalanced Send Data (SD) BNC connector located on the Universal Interface Module.

2.6.2 J2 - DDO - Drop Data Out

J2 is the Unbalanced Drop Data Out (DDO) BNC connector located on the Universal Interface Module.

2.6.3 J3 - IDI - Insert Data In

J3 is the Unbalanced Insert Data In (IDI) BNC connector located on the Universal Interface Module.

2.6.4 J4 - RD - Receive Data

J4 is the Unbalanced Receive Data (RD) BNC connector located on the Universal Interface Module.

2.6.5 J5 - ESC Audio

J5 is the 9-pin 'D' Female ESC Audio Channel connector. The pinouts for this connector are shown below in Table 2-6.

Table 2-6. J5 - ESC Audio - 9-Pin 'D' Female

Pin No.	Signal	Description	Direction
1	ESCAUD TX 1A	Tx Audio 1A (-)	Input
2	ESCAUDRX 1A	Rx Audio 1A (-)	Output
3	GND	Ground	None
4	ESCAUDTX 2B	Tx Audio 2B (+)	Input
5	ESCAUDRX 2A	Rx Audio 2A (-)	Output
6	ESCAUDTX 1B	Tx Audio 1B (+)	Input
7	ESCAUDRX 1B	Rx Audio 1B (+)	Output
8	ESCAUDTX 2A	Tx Audio 2A (-)	Input
9	ESCAUDRX 2A	Rx Audio 2A (-)	Output

2.6.6 J6 - ES/ES

The connector pinouts for J6, the 9-Pin Earth-Station-to-Earth-Station asynchronous data connector are shown below.

Table 2-7. J6 - ES/ES - 9-Pin 'D' Female			
Pin No.	**Signal**	**Description**	**Direction**
1	GND	Ground	None
2	RXD-232	Receive Data RS232	Output
3	TXD-232	Transmit Data RS232	Input
4	TXD-B	Transmit Data RS485 (+)	Input
5	TXD-A	Transmit Data RS485 (-)	Input
6	NC	No Connection	None
7	NC	No Connection	None
8	RXD-B	Receive Data B RS485 (+)	Output
9	RXD-A	Receive Data A RS485 (-)	Output

2.6.7 J7 – ESC Alarm Interface

The connector pinouts for J7, the 25-Pin ESC Alarm Interface are shown below.

Table 2–8. J7 - ESC Alarm Interface - 25-Pin Female 'D'			
Pin Number	**Signal**	**Description**	**Direction**
1	GND	Ground	None
2	ESCBWO 1 NO	Backward Alarm Out-1 NO	None
3	NC	No Connection	None
4	ESCBWO 1 NO	Backward Alarm Out-2 NO	None
5	NC	No Connection	None
6	ESCBWO 4 NO	Backward Alarm Out-4 NO	None
7	GND	Ground	None
8	ESCBWO 4 NO	Backward Alarm Out-4 NO	None
9	NC	No Connect	None
10	ESCBWI 2	Backward Alarm In 2	Input
11	ESCBWI 4	Backward Alarm In 4	Input
12	NC	No Connect	None
13	NC	No Connect	None

14	ESCBWO 1C	Backward Alarm Out 1-C	None
15	ESCBWO 1-NC	Backward Alarm Out 1-NC	None
16	ESCBWO 2-C	Backward Alarm Out 2-C	None
17	ESCBWO 2-NC	Backward Alarm Out 2-NC	None
18	ESCBWO 3-C	Backward Alarm Out 3-C	None
19	ESCBWO 3-NC	Backward Alarm Out 3-NC	None
20	ESCBWO 4-C	Backward Alarm Out 4-C	None
21	ESCBWO 4-NC	Backward Alarm Out 4-NC	None
22	ESCBWI 1	Backward Alarm In 1	Input
23	ESCBWI 1	Backward Alarm In 3	Input
24	NC	No Connection	None
25	NC	No Connect	None

2.6.8 J8 - ESC 8K Data Interface

J8 is the 15-pin ESC IDR 8-Kbit overhead data connector. The pinouts are shown below.

Table 2-9. J8 - ESC 8K Data Interface 15-Pin Female 'D' Connector

Pin No.	Signal Name	Signal	Direction
1	ESCRXO-B	Rx Octet-B (+)	Output
2	ESCRXC-B	Rx Clock-B (+)	Output
3	ESCRXD-B	Rx Data-B (+)	Output
4	NC	No Connect	None
5	NC	No Connect	None
6	ESCTXD-A	Tx Data-A (-)	Output
7	ESCTXC-A	Tx Clock-A (-)	Output
8	ESCTXO-A	Tx Octet-A (-)	Output
9	ESCRXO-A	Rx Octet-A (-)	Output
10	ESCRXC-A	Rx Clock-A (-)	Output
11	ESCRXD-A	Rx Data-A (-)	Output
12	GND	Ground	None
13	ESCTXD-B	Tx Data-B (+)	Input
14	ESCTXC-B	Tx Clock-B (+)	Output
15	ESCTXO-B	Tx Octet-B (+)	Output

2.6.9 J9- G.703 (Balanced)

J9 is the G.703 (Balanced) 15-pin data connector. The pinouts are shown below.

Table 2-10. J9 - G.703 (Balanced) 15-Pin Female 'D' Connector			
Pin No.	**Signal Name**	**Signal**	**Direction**
1	Send Data A (-)	SD-A	Input
9	Send Data B (+)	SD-B	Input
7	External Clock A (-)	BAL EXC-A	Input
8	External Clock B (+)	BAL EXC-B	Input
3	Receive Data A (-)	RD-A	Output
11	Receive Data B (+)	RD-B	Output
12	Drop Data Out A (-)	DDO-A	Output
5	Drop Data Out B (+)	DDO-B	Output
13	Insert Data In A (-)/EXC A (-)	IDI-A	Input
6	Insert Data In B (+)/ESC B (+)	IDI-B	Input

2.6.10 J10 - Sync Data

J10 is the 37-pin synchronous data connector located on the Universal Interface Module. The pinouts are shown below in Table 2-11.

Table 2–11. J10 - Sync Data RS422/RS485/V.35 - 37-Pin Female			
Pin Number	**Signal**	**Description**	**Direction**
3	TXO-A	Transmit Octet A (-)	Input
21	TXO-B	Transmit Octet B (+)	Input
4	SD-A	Send Data A (-)	Input
22	SD-B	Send Data B (+)	Input
5	ST-A	Send Timing A (-)	Output
23	ST-B	Send Timing B (+)	Output
6	RD-A	Receive Data A (-)	Output
24	RD-B	Receive Data B (+)	Output
7	RS-A	Request to Send A (-)	Input
25	RS-B	Request to Send B (+)	Input
8	RT-A	Receive Timing A (-)	Output
26	RT-B	Receive Timing B (+)	Output

9	CS-A	Clear to Send A (-)	Output
10	MF	Mod Fault - Open Collector	Output
28	DF	Demod Fault - Open Collector	Output
27	CS-B	Clear to Send B (+)	Output
11	DM-A	Data Mode A (-)	Output
29	DM-B	Data Mode B (+)	Output
13	RR-A	Receiver Ready A (-)	Output
31	RR-B	Receiver Ready B (+)	Output
15	BAL EXC-A	External Clock A (-)	Input
33	BAL EXC-B	External Clock B (+)	Input
16	RX-0-A	Receive Octet A (-)	Output
34	RX-0 B	Receive Octet B (+)	Output
17	TT-A	Terminal Timing A (-)	Input
35	TT-B	Terminal Timing B (+)	Input
1, 19, 20, 37	GND	Signal Ground	

2.6.11 Digital Data Switch (DDS20) J1 through J10 - Switch Connector

J1 through J10 are the 68-Pin high-density data connectors that carry data to and from the modem. The pinouts for these connectors are shown below in Table 2-12.

Table 2-12. J18 - Switch Connector - 68-Pin High-Density Female

Pin No.	Signal	Description	Direction
1	G.703B SD-A	G.703 Send Data Input A (-)	Input
2	SYNC SD-A	Synchronous Data Send Data Input -A (-)	Input
3	ESCBWO 1C	IDR ESC Backward Alarm Out - 1 Common	None
4	G.703B IDI-A	G.703 Insert Data Input - A (-)	Input
5	SYNC ST-A	Synchronous Data Send Timing Output - A	Output
6	ESCBWO 1NO	IDR ESC Backward Alarm Out - 1 Normally Open	Input
7	SYNC TT-A	Synchronous Data Terminal Timing Input A	Input
8	ESCBWO 2NC	IDR ESC Backward Alarm Out - 2 Normally Closed	
9	DDO-A RT-A	G.703 Drop Data Out A - Synchronous Data Receive Timing Output - A	Output

10	ESCBWO 3C	IDR ESC Backward Alarm Output - 3 Common	
11	IDO-A RD-A	G.703 Insert Data Out A - Synchronous Data Receive Data A	Output
12	ESCBWO 3NO	IDR ESC Backward Alarm Output - 3 Normally Open	
13	BAL EXC-A	External Clock Input - A	Input
14	GND	Ground	
15	ESCAUDTX 1A	IDR ESC Audio Input Channel 1A	Input
16	ESCAUDTX 2A	IDR ESC Audio Input Channel 2A	Input
17	ESCAUD RX 1A	IDR ESC Audio Output Channel 1A	Output
18	ESCAUD RX 2A	IDR ESC Audio Output Channel 2A	Output
19	ESCBWI 3	IDR ESC Backward Alarm Input - 3	Input
20	TXD-A BWI 1	IBS ES Transmit Data A IDR ESC Backward Alarm Input 1	Input
21	MOD FLT	Mod Fault Open Collector Output	Output Open Collector
22	ES RXD-A	IBS ES Receive Data Output - A	Output
23	ES DSR	IBS ES Data Set Ready (RS232 Only)	Output
24	ESCTXC-A	IDR ESC Transmit 8 Kbps Output Clock	Output
25	ESCTXD-A	IDR ESC Transmit 8 Kbps Output Data	Input
26	ESCRXC-A	IDR ESC Receive 8 Kbps Output Clock	Output
27	ESCRXD-A	IDR ESC Receive 8 Kbps Output Data	Output
28	ESCBWO 4NC	IDR ESC Backward Alarm Output - 4 Normally Closed	
29	TXO-A	IBS Transmit Octet Input - A	Input
30	SYNC DM-A	Synchronous Data Mode A	Output
31	SYNC CS-A	Synchronous Data Clear to Send - A	Output
32	RXO-A	IBS Receive Octet Output - A	Output
33	SYNC RS-A	Synchronous Data Request to Send A	Input
34	SYNC RR-A	Synchronous Data Receiver Ready - A	Output
35	G703B SD-B	G.703 Send Data Input - B	Input
36	SYNC SD-B	Synchronous Data Send Data Input - B	Input
37	ESCBWO 1 NC	IDR ESC Backward Alarm Out - 1 Normally Closed	

38	G703B IDI-B	G.703 Insert Data Input - B	
39	SYNC ST-B	Synchronous Data Send Timing Output B	
40	ESCBWO 2C	IDR ESC Backward Alarm Out 2 Common	
41	SYNC TT-B	Synchronous Data Terminal Timing - B	
42	ESCBWO 2NO	IDR ESC Backward Alarm Output 2 Normally Open	
43	DDO-B RT-B	G.703 Drop Data Out - B Synchronous Data Receive Timing B	
44	ESCBWO 3NC	IDR ESC Backward Alarm Out - 3 Normally Closed	
45	IDO-B RD-B	G.703 Insert Data Out Synchronous Data	
46	ESCBWO 4C	IDR ESC Backward Alarm Out - 4 Common	
47	BAL EXC-B	External Clock Input B	Input
48	GND	Ground	
49	ESCAUDTX 1B	IDR ESC Audio Input Channel 1B	Input
50	ESCAUDTX 2B	IDR ESC Audio Input Channel 2B	Input
51	ESCAUDRX 1B	IDR ESC Audio Output Channel 1B	Output
52	ESCAUDRX 2B	IDR ESC Audio Output Channel 2B	Output
53	ESCBWI 4	IDR ESC Backward Alarm Input - 4	
54	TX-B BWI 2	IBS ES Transmit Data B IDR ESC Backward Alarm Input 2	Input
55	DMD FLT	Demod Fault Open Collector Output	Output Open Collector
56	ES RXD-B	IBS ES Receive Data Input - B	Output
57	GND	Ground	
58	ESCTXC-B	IDR ESC Transmit 8 Kbps Output Clock B	Output
59	ESCTXD-B	IDR ESC Transmit 8 Kbps Output Data B	Input
60	ESCRXC-B	IDR ESC Receive 8 Kbps Clock Output B	Output
61	ESCRXD-B	IDR ESC Receive 8 Kbps Data Output B	Output
62	ESCBWO 4NO	IDR ESC Backward Alarm Out - 4 Normally Open	
63	TXO-B	IBS Transmit Octet Input B	Input
64	SYNC DM-B	Synchronous Data - Data Mode Out B	Output
65	SYNC CS-B	Synchronous Data - Clear to Send B	Input
66	RXO-B	IBS Receive Octet Output B	Output

67	SYNC RS-B	Synchronous Data Request to Send - B	Input
68	SYNC RR-B	Synchronous Data Receiver Ready B	Output

2.6.12 RCU20 Connector Pinouts

Table 2-13. J1 - Switch Interface Control Card - Alarms - 9-pin 'D' Male

Pin No.	Signal	Description	Direction
1	MJA-NC	Major Alarm - NC	None
2	MJA-C	Major Alarm - C	None
3	MJA-NO	Major Alarm - NO	None
4	NC	No Connect	None
5	NC	No Connect	None
6	NC	No Connect	None
7	MNA-NC	Minor Alarm - NC	None
8	MNA-C	Minor Alarm - C	None
9	MNA-NO	Minor Alarm - NO	None

Table 2-14. J2 - Switch Interface Control Card - RS232 Terminal Interface - 9-Pin 'D' Female

Pin No.	Signal	Description	Direction
1	NC	No Connect	None
2	RxD	Receive Data	Input
3	TxD	Transmit Data	Output
4	NC	No Connect	None
5	GND	Ground	None
6	NC	No Connect	None
7	NC	No Connect	None
8	NC	No Connect	None
9	NC	No Connect	None

Table 2-15. J3 - Switch Interface Control Card - RS485 Remote Interface - 9-Pin 'D' Female			
Pin No.	**Signal**	**Description**	**Direction**
1	TxD-B	Transmit Data B (+)	Output
2	NC	No Connect	None
3	NC	No Connect	None
4	NC	No Connect	None
5	COMMON	Signal Common	None
6	TxD-A	Transmit Data A (-)	Output
7	NC	No Connect	None
8	RxD-B	Receive Data B (+)	Input
9	RxD-A	Receive Data A (-)	Input

Table 2-16. J3 - Switch Interface Control Card - RS232 Terminal Interface - 9-Pin 'D' Female			
Pin No.	**Signal**	**Description**	**Direction**
1	NC	No Connect	None
2	RxD	Receive Data	Input
3	TxD	Transmit Data	Output
4	NC	No Connect	None
5	GND	Ground	None
6	NC	No Connect	None
7	NC	No Connect	None
8	NC	No Connect	None
9	NC	No Connect	None

Table 2-17. J3 - Bank Control Card - DDS20 Control and Power - 15-pin HD 'D' Female			
Pin No.	**Signal**	**Description**	**Direction**
1	DDS_LCLK	Serial Control Clock	Output
2	VCC_RELAY	Relay +6 Volts	Output
3	DDS_LDAT2	Serial Control Data 2	Bi-directional
4	GND	Ground	None
5	GND	Ground	None
6	VCC	Logic +5 Volts	Output
7	VCC_RELAY	Relay +6 Volts	Output
8	VCC_RELAY	Relay +6 Volts	Output
9	GND	Ground	None
10	GND	Ground	None
11	VCC_RELAY	Relay +6 Volts	Output
12	DDS_LDAT1	Serial Control Data 1	Bi-directional
13	GND	Ground	None
14	DDS_LDAT3	Serial Control Data 3	Bi-directional
15	INT	DDS20 Interrupt	Input

Table 2-18. J2 - Bank Control Card - IFS20 Control and Power - 15-pin HD 'D' Female			
Pin No.	**Signal**	**Description**	**Direction**
1	IFS_LCLK	Serial Control Clock	Output
2	NC	No Connect	None
3	NC	No Connect	None
4	GND	Ground	None
5	GND	Ground	None
6	VCC	Logic +5 Volts	Output
7	VCC_RELAY	Relay +6 Volts	Output
8	NC	No Connect	None
9	NC	No Connect	None
10	GND	Ground	None
11	VCC_RELAY	Relay +6 Volts	Output

12	IFS_LDAT1	Serial Control Data 1	Bi-directional
13	NC	No Connect	None
14	NC	No Connect	None
15	NC	No Connect	None

Table 2-19. J1 - Bank Control Card - RS485 Modem Control - 9-pin 'D' Female

Pin No.	Signal	Description	Direction
1	TxD-B	RS485/HDLC Transmit Data B (+)	Output
2	TCLK-A	HDLC Transmit Clock A (-)	Output
3	TCLK-B	HDLC Transmit Clock B (+)	Output
4	RCLK-A	HDLC Receive Clock A (-)	Input
5	COMMON	Signal Common	None
6	TxD-A	RS485/HDLC Transmit Data A (-)	Output
7	RCLK-B	HDLC Receive Clock B (+)	Input
8	RxD-B	RS485/HDLC Receive Data B (+)	Input
9	RxD-A	RS485/HDLC Receive Data A (-)	Input

Table 2-20. IFS20, J42 - IFS20 Control and Power - 15-pin HD 'D' Female			
Pin No.	**Signal**	**Description**	**Direction**
1	IFS_LCLK	Serial Control Clock	Input
2	NC	No Connect	None
3	NC	No Connect	None
4	GND	Ground	None
5	GND	Ground	None
6	VCC	Logic +5 Volts	Input
7	VCC_RELAY	Relay +6 Volts	Input
8	NC	No Connect	None
9	NC	No Connect	None
10	GND	Ground	None
11	VCC_RELAY	Relay +6 Volts	Output
12	IFS_LDAT1	Serial Control Data 1	Bi-directional
13	NC	No Connect	None
14	NC	No Connect	None
15	NC	No Connect	None

RADYNE
COMSTREAM

Section 3 – Operation

3.0 Principles of Operation

This chapter provides additional basic information on the RCU20 and IFS20 hardware and internal operation.

3.1 RCS20 Major Assemblies

The RCU20 Redundancy Control Unit contains the modules that control and monitor the operation of the M:N Switch System. The RCU20 is composed of the following major assemblies and components:

1. Central Processor Unit (CPU) Board
2. Front Panel Board
3. Controller Interface Module
4. Clock Distribution Module (optional)
5. Dual Redundant Power Supplies
6. Ethernet Module (optional)
7. Bank Control Module

3.1.1 Central Processing Unit (CPU) Board

The Central Processor Unit (CPU) Board contains the M:N Switch intelligence and memory circuitry. The on-board microprocessor is an MC68302, which has a 24-bit address bus and a 16-bit data bus. The microprocessor controls and coordinates all major functions of the Switch and performs all necessary calculations. The non-volatile system memory on the board stores the switching parameter settings for each Modem Channel. Control and data signals are routed to the appropriate devices in the system through various latches and transceivers that are controlled by the microprocessor.

3.2 Redundant Power Supplies

The M:N Switch comes equipped with two fully redundant internal power supplies (PS1 and PS2) that supply DC voltage to the system. Each supply is fully independent of the other, including their source of AC power and fusing.

The Switch can remain fully operational as long as it is supplied with a source of voltage from either power supply. Only if the voltage output failed on both supplies would the Switch become inoperative. PS1 and PS2 are located one on either side of the RCS20.

3.3 RCU20 Rear Panel

As previously shown in Figure 2-1, the RCS20 contains the plug-in slots for the Interface Control Module, the Clock Distribution Modules, Bank Control Modules and Ethernet modules. Also contained in the back panel are the two AC fuses and power receptacles.

3.4 IFS20 Major Assemblies

The IFS20 IF Switch interfaces the IF signals of the Modems with the earth station IF system and provides back-up switching. The unit provides all of the switching relays, signal combiners and splitters, terminations and interconnecting cables that are necessary to connect any combination of up to eight Modulators and Demodulators to eight independent uplink and eight independent downlink Transponders.

The IFS20 has no internal power supply. It receives its DC power from the RCU20 through the cable that connects to J35. The IFS20 internal connectors are SMB-type.
The major parts of the IFS20 are:

1. Eight uplink and eight downlink IF Relays.
2. Back Panel.

3.5 IF Switch Relays

The IFS20 contains 16 IF Switch Relays; eight uplink and eight downlink. The relays switch the IF signals to the Backup units. The signals to each downlink relay pass through a splitter with a loss of about 3.5 dB (including the loss due to energy splitting).

3.6 DDS20 Major Assemblies

The DDS20 Data Switch provides terrestrial interface and data signal switching for up to nine independent pairs of Modulators and Demodulators. There are two parallel and independent backup busses allowing any of the eight on-line Modulators and Demodulators to be switched to either of the backup Modulators or Demodulators. The major components of the DDS20 listed in Table 3-1.

Table 3-1. DDS20 Major Components

Motherboard	Contains the modem connectors and backup busses.
Slide-In Data Switch Interface Modules	One for each prime modem, containing terrestrial interface connectors and data switch relays.
Housing	Contains the card guides and mounting ears for the motherboard.
Rear Panel	Contains the electrical connections.

The DDS20 has no internal power supply, it receives DC power from the RCU20 through the cable that connects at J31.

Section 4 – User Interfaces

4.0 Operating Procedures

Operation of the RCS20 consists of controlling the unit operating parameters and monitoring status and responses via one of the control interfaces. There are three possible control options for the modem:

Front Panel Control
Terminal Mode Control
Command Interface Control

Any of these methods may be used separately or together to monitor and control the RCS20.

4.1 Front Panel Control

The front panel of the RCS20 allows complete control and monitoring of all Modem and Switch parameters and functions via a keypad, LCD display and Modem and Switch status LEDs.

4.1.1 Front Panel Layout and Features

The front panel layout is shown in Figure 3–1, showing the location and labeling of the front panel controls and indicators. The front panel is divided into the following functional areas: the LCD front panel display, Modem and Switch parameter selection buttons, the numeric Keypad and the LED Indicators, each described below.

4.1.2 Front Panel LCD Display

The front panel display is an 8 line by 40 character LCD display. The display is lighted and the brightness can be set to increase when the front panel is currently in use. The LCD display automatically dims after a period of inactivity.

The display has two distinct areas showing current information. The bottom row of the display shows the functions of each of the four soft keys (labeled ‘S1’, ‘S2’, ‘S3’, and ‘S4’ in Figure 3-1). If a soft key provides a function, then that function will be displayed just above the corresponding key. If no function is displayed above a soft key, then there is no function associated with that key, and pressing it will have no effect. The rest of the display shows current parameter and status information. The LCD display is a window into a large matrix of switch and modem parameters that can monitored and changed from the front panel.

The display backlight will extinguish after a programmable delay if no there is no keyboard activity. The backlight will then turn on whenever a key is pressed. The backlight delay can be adjusted from the menu.

4.1.3 Front Panel Keypad

The front panel keypad consists of eight areas, as shown in Figure 4-1 and listed in Table 4-1.

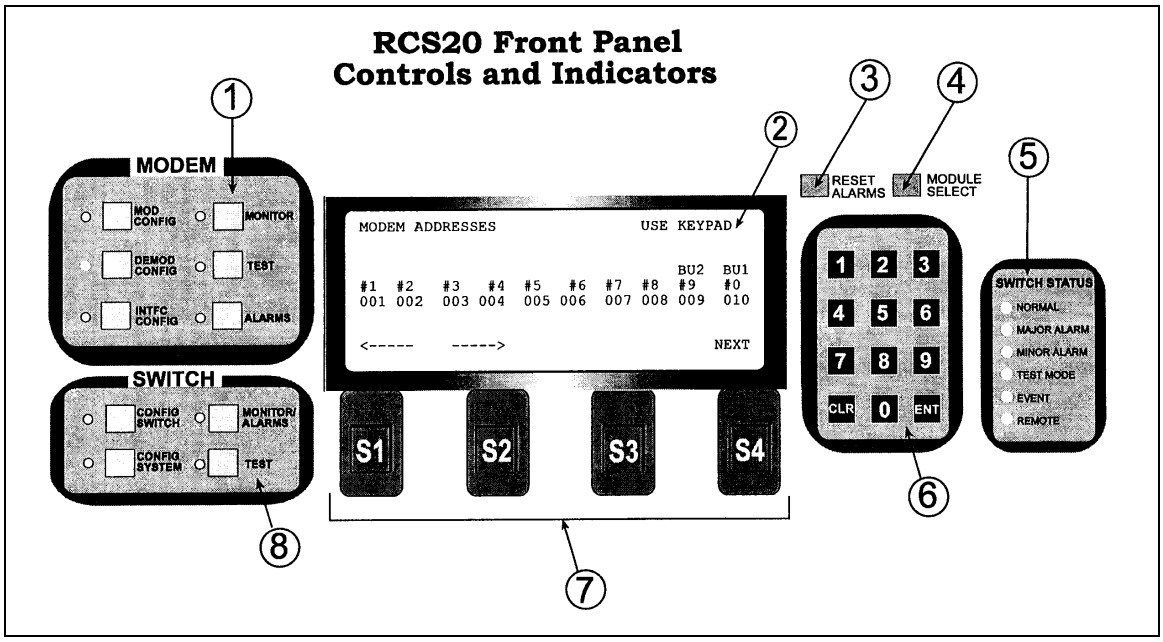


Figure 4-1.

Table 4-1		
Item No.	**Label**	**Description**
1	MODEM	Modem Control. This group of keys is used to control the modems connected to the RCS20 from the RCS20 front panel. This feature is presently not implemented for the RCS20
2	(None)	LCD. This is the 8 lines by 40 characters Liquid Crystal Display, used to communicate with the RCS20.
3	RESET ALARMS	Reset Alarms. This key resets all RCS20 current and latched major and minor alarms.
4	MODEM SELECT	Select Current Modem. This key selects which modem is currently being controlled by the Modem group of keys. This feature is presently not implemented for the RCS20
6	(None)	Numeric Keypad. This group of keys is used to enter numeric parameters for the RCS20 and connected modems.
7	(None)	Soft keys. This group of keys is used for various functions as described by the label shown above each key on the last line of the LCD.
8	SWITCH	Switch Control. This group of keys is used to control the RCS20.

The ten keys contained in the MODEM and SWITCH are used to view and change a particular set of control parameters as described by the label next to the key. Each of these keys are used to display a series of menu trees that are displayed on the LCD and used to view and enter control parameters. These keys and their corresponding menus are described separately below:

4.1.3.1 MODEM-MOD CONFIG

Pressing this key brings up a series of menus on the LCD that allow control of the currently selected modulator that is connected to the RCS20. The currently selected modulator and demodulator can be changed by pressing the MODEM SELECT key. This feature is presently not implemented on the RCS20

4.1.3.2 MODEM-DEMOD CONFIG

Pressing this key brings up a series of menus on the LCD that allow control of the currently selected demodulator that is connected to the RCS20. The currently selected modulator and demodulator can be changed by pressing the MODEM SELECT key. This feature is presently not implemented on the RCS20

4.1.3.3 MODEM-INTFC CONFIG

Pressing this key brings up a series of menus on the LCD that allow control of the terrestrial interface for the currently selected modem. The currently selected modem can be change by pressing the MODEM SELECT key. This feature is presently not implemented on the RCS20.

4.1.3.4 MODEM-MONITOR

Pressing this key brings up a series of menus on the LCD that allow the monitoring of status parameters for modems connected to the RCS20. This feature is presently not implemented on the RCS20.

4.1.3.5 MODEM-TEST

Pressing this key brings up a series of menus on the LCD that allow testing of the modems connected to the RCS20. This feature is presently not implemented on the RCS20.

4.1.3.6 MODEM-ALARMS

Pressing this key brings up a series of menus on the LCD that allow monitoring of alarms for the modems connected to the RCS20. This feature is presently not implemented on the RCS20.

4.1.3.7 SWITCH-CONFIG SWITCH

Pressing this key brings up a series of menus on the LCD that allow control of the RCS20 switch configuration parameters.

4.1.3.8 SWITCH-CONFIG SYSTEM

Pressing this key brings up a series of menus on the LCD that allow control of the RCS20 system, monitor & control, and communication parameters.

4.1.3.9 SWITCH-MONITOR/ALARMS

Pressing this key brings up a series of menus on the LCD that allow monitoring of major and minor alarms and control of alarm masking for the RCS20.

4.1.3.10 SWITCH-TEST

Pressing this key brings up a series of menus on the LCD that allow testing of the RCS20 configurations and connections.

4.1.4 Front Panel LCD Indicators

There are sixteen (16) LEDs on the RCS20 front panel to indicate the selected LCD menu tree and current switch status. The color of the illuminated LEDs on the front panel indicate overall switch status according to the following key: An illuminated green LED indicates normal operation. An illuminated yellow LED indicates a condition that is not proper for normal operation, however, all satellite channels are currently on-line. An illuminated red LED indicates that the RCS20 was unable to provide redundancy protection for a satellite channel, and at least one channel is off-line. For the purposes of this discussion, the LEDs are separated into two major groups, MENU LEDs and SWITCH STATUS LEDs. The Menu LEDs are those LEDs immediately next to the front panel keys in the MODEM and SWITCH groups, and the SWITCH STATUS LEDs are those in the SWITCH STATUS group (see Table 4-2).
Menu LED Indicators (*Green*)

Each Menu LED corresponds to the MODEM group or SWITCH group key located to the right of the LED. When lit these LEDs indicate which menu tree is currently active on the LCD. For example, if the SWITCH-TEST LED is illuminated, then the LCD is displaying one of the menus that allow control of RCS20 test modes.

Table 4-2. Switch Status LEDs

LED	Color	Description
Normal	Green	Indicates that the unit is currently under power.
Major Alarm	Red	Indicates that at least one satellite channel did not receive redundancy protection and is off-line.
Minor Alarm	Yellow	Indicates that a redundancy warning exists and the RCS20 may not be providing redundancy protection.
Test Mode	Yellow	Indicates that the switch is performing one of the system tests.
Event	Yellow	Indicates that a condition of system event as occurred that the RCS20 has stored in memory. The events may be viewed from the Front Panel or from the Terminal port.
Remote	Green	Indicates that the unit is set to respond from either the Terminal port or the Remote M&C port

4.1.5 Guide to Front Panel Monitor and Control

The front panel can be used to perform complete monitor and configuration of the RCS20. The operation of the front panel becomes easy after a short period of use in which the user becomes

familiar with the basic concepts and operations. Front panel control is implemented as a series of data entry screen. The data entry screens ("screens") are organized into several groups that contain related parameters and status values. Screens allow the modification of control parameters, display of status parameters, or both. Different screens will be displayed on the front panel based on key presses from the front panel. The screens will be displayed in order; this order defines the 'menu tree' for a particular group of related screens. A complete description of control from the front panel, including explanations of each screen in the menu trees, is found below.

4.2 Remote Port Control

The RCS20 has a dedicated RS485 serial control port (Remote Port) for use with computer controlled remote monitor and control systems. The Remote Port is a 9-pin female 'D' sub connector J3 located at the rear of the unit on the Switch Interface plug in module. The pinouts for the remote port are listed in Section 2. The Remote Port utilizes a binary protocol called Radyne Link Level Protocol (RLLP). RLLP is a multi-drop packet-oriented protocol with handshaking, and is completely described in Appendix B at the end of this manual. The remote port supports standard UART asynchronous protocol with 8 data bits, no parity, and 1 stop bit (8N1) at 4 baud rates: 9600, 4800, 2400, and 1200.

4.3 Terminal Port Control

The RCS20 has a dedicated RS232 serial port (Terminal Port) for use with a separate terminal or computer running a terminal emulation program. The Terminal Port is a 9-pin female 'D' sub connector J2 located at the rear of the unit on the Switch Interface plug in module. The pinouts for the remote port are listed in Section 2. The terminal port supports standard UART asynchronous protocol with 8 data bits, no parity, and 1 stop bit (8N1) at 4 baud rates: 19200, 9600, and 2400.

4.3.1 Terminal Interface

The terminal interface is menu driven and allows complete monitoring and control of all RCS20 parameters. A complete listing of all terminal interface configuration menus can be found in Appendix C at the end of this manual. Three terminal emulation protocols are supported: DEC VT-100 , Wyse-50 , and ADDS Viewpoint. The terminal display is a full screen presentation of the current status of the switch modes and variables. The screens will display both status and control variables. The status variables cannot be modified, but the control variables can be. Each variable that can be modified will have a display number next to the value, and changing the value is accomplished by typing the number of the variable to be changed. Two types of input may then be requested from the user. If the input is multiple choice, the space key must be pressed to cycle the available choices until the desired value is displays. The 'Enter' or carriage return key must then be pressed for the new value to take effect. If the input is numerical, the desired value should be typed using number keys ('0' to '9'), then pressing the 'Enter' key. An input can be aborted at any time by pressing the 'ESC' key. If an invalid value is entered, and error message will be displayed on the terminal.

4.4 Modem Checkout and Initial Power-up

The following descriptions assume that the RCS20 is installed in a suitable location with AC power applied to both slide out power supplies. Before initial power-up of the RCS20, the IFS20 and DDS20 must be connected to the RCU20 via the supplied 15-pin high-density 'D' sub connection cables.

***Never** apply power to the slide out power supply modules unless they are firmly seated in the RCU20, as there is a potential shock hazard at the AC/DC Converter within the module.*

Turn the unit on by switching both AC power switches (located above the power entry connectors at the rear of the RCU20) to the on position. At power-up, the switch processor will perform a self-diagnostic before beginning the primary monitor/control program. If a failure is detected during the power-up tests, the Major Alarm LED will illuminate. If there is no failure, there will be no indication on the front panel.

The initial field checkout of the switch can either be accomplished from the front panel or from a terminal connected to the Terminal Port. Using a terminal has the advantage of providing full screen access to all of the switch parameters, but requires a separate terminal or computer with terminal emulation software. If a terminal is used, the Terminal Port baud rate must first be set from the front panel.

4.5 RCS20 Front Panel Data Entry Screens

Control from the front panel of the RCS20 is implemented through a series of data entry screens ("screens") that are displayed on the front panel LCD. The screens are organized into groups of related parameters and status values. Within a single group, the screens are displayed on the LCD in a particular order; this order defines the 'menu tree' for that particular group of screen. Each menu tree is accessed by pressing one of the following keys on the RCS20 front panel:

CONFIG SWITCH, CONFIG SYSTEM, MONITOR/ALARMS, and TEST in the SWITCH group, or MOD CONFIG, DEMOD CONFIG INTFC CONFIG, MONITOR, TEST and ALARMS in the MODEM group. For example, pressing the CONFIG SWITCH key causes CONFIG SWITCH SCREEN 0 - MODEM CONNECTIONS to be displayed on the LCD (See Figure A-1). The first screen of each menu tree is called the top screen of that particular menu tree. The menu trees for the SWITCH group of screens are shown in Figures 3-2, 3-3, 3-4, and 3-5 for the CONFIG SWITCH, CONFIG SYSTEM, MONITOR/ALARMS, and TEST menu trees respectively.

4.5.1 Basic Front Panel Controls

Once the top screen for a particular menu tree is displayed, either the parameters on the screen can be edited, the next screen in the menu tree can be displayed, or the previous screen in the menu tree can be displayed. Each of these actions is discussed in detail below.

4.5.1.1 Changing parameters from the Front Panel

Whenever there is a parameter that can be changed or edited from the front panel, the first character of the parameter value will highlight with a blinking box. This box is called the cursor, and the cursor defines what parameter is currently being edited. If there are several parameters on one screen, two of the soft keys will be labeled <--- and --->. These keys are used to move the cursor from one parameter to the next, and therefore any of the configuration parameters displayed on the screen can be edited. The left arrow (<---) moves the cursor to the left, and the right arrow (--->) moves the cursor to the right. If the cursor is at the beginning or end of a row containing several parameters, the cursor will wrap to the opposite side of the display.

Editing a configuration parameter value is accomplished in one of several ways. If the parameter is numerical, the desired value should be entered from the numeric keys. Occasionally, the numeric values can be incremented and decremented by pressing soft keys labeled 'UP' and 'DOWN' respectively. In either case, when all of the numerical parameters have been edited to the desired values, pressing the ENTER key will execute a load of the parameters into memory, and then advance to the next screen in the menu tree. Pressing the CLEAR key will *not* execute a load of parameters into memory (the original parameter values before editing will be retained), and then advance to the previous screen in the menu tree.

If a parameter has a non-numeric value, the allowed values for that parameter can be edited by pressing soft keys with the desired values. In cases where there are multiple parameters shown on a screen, the values are edited with the soft keys and loaded by pressing the ENTER key, which also advances to the next screen in the menu tree. Pressing the soft key labeled 'NEXT' or 'PREVIOUS' will abort loading the parameters into memory, and advance to the appropriate screen. In cases where there is a single parameter shown on a screen, pressing the soft key labeled with the desired value will immediately load the parameter into memory. In this case, the parameter load can be aborted by pressing the CLEAR key, which will return to the previous screen, or by pressing the soft key labeled 'NEXT', which will advance to the next screen in the menu tree.

4.5.1.2 Moving to the Next Screen in a Menu Tree

If the user desires to advance to the next screen in the menu tree, the soft key labeled 'NEXT' should be pressed. Some submenu screens can only return to a previous screen, in this case a soft key will be labeled 'RETURN'. In either case, if any numerical parameters are being edited, the values will *not* be loaded into memory. When the last screen of a menu tree is reached, advancing to the next screen will wrap to the first screen of the menu tree.

4.5.1.3 Moving to the Previous Screen in a Menu Tree

If the user desires to advance to the previous screen in the menu tree, the CLEAR key should be pressed. If any numerical parameters are being edited, the values will *not* be loaded into memory. If the clear key is pressed while the first screen of a menu tree is displayed, the previous screen will wrap to the last screen in the menu tree.

4.5.1.4 Summary of Basic Front Panel Controls

Table 4-3 describes the functionality of the front panel keyboard in relation to front panel control.

Table 4-3.	
ENTER	Loads edited values into memory and advances to next screen in the menu tree.
CLEAR	Aborts loading values into memory and advances to the previous screen in the menu tree.
soft key ('NEXT')	Aborts loading values into memory and advances to the next screen in the menu tree.
soft key ('PREVIOUS')	Aborts loading values into memory and advances to the previous screen in the menu tree.
numeric keys	Used to edit numeric parameters.

4.6 Front Panel Menu Trees and Screens

There are four menu trees used to control the RCS20: CONFIG SWITCH, CONFIG SYSTEM, MONITOR/ALARMS, and TEST. These menu trees are shown in flowchart form in Figures 3-2 to 3-5. Each block in a menu tree flowchart represents a data entry screen, and the arrowed lines between the blocks represent movement between screens in response to front panel key presses.

Each menu tree diagram is accompanied by a set of figures detailing each data entry screen and the result of key presses for that data entry screen. The CONFIG SWITCH screens are shown in Figure 3-x through 3-x, the CONFIG SYSTEM screens are shown in Figures 3-x through 3-x, the MONITOR/ALARMS screens are shown in Figures 3-x through 3-x, and the TEST screens are shown in figures 3-x through 3-x. These screen figures are annotated with explanations of the displayed parameters and details on editing the parameters for each screen.

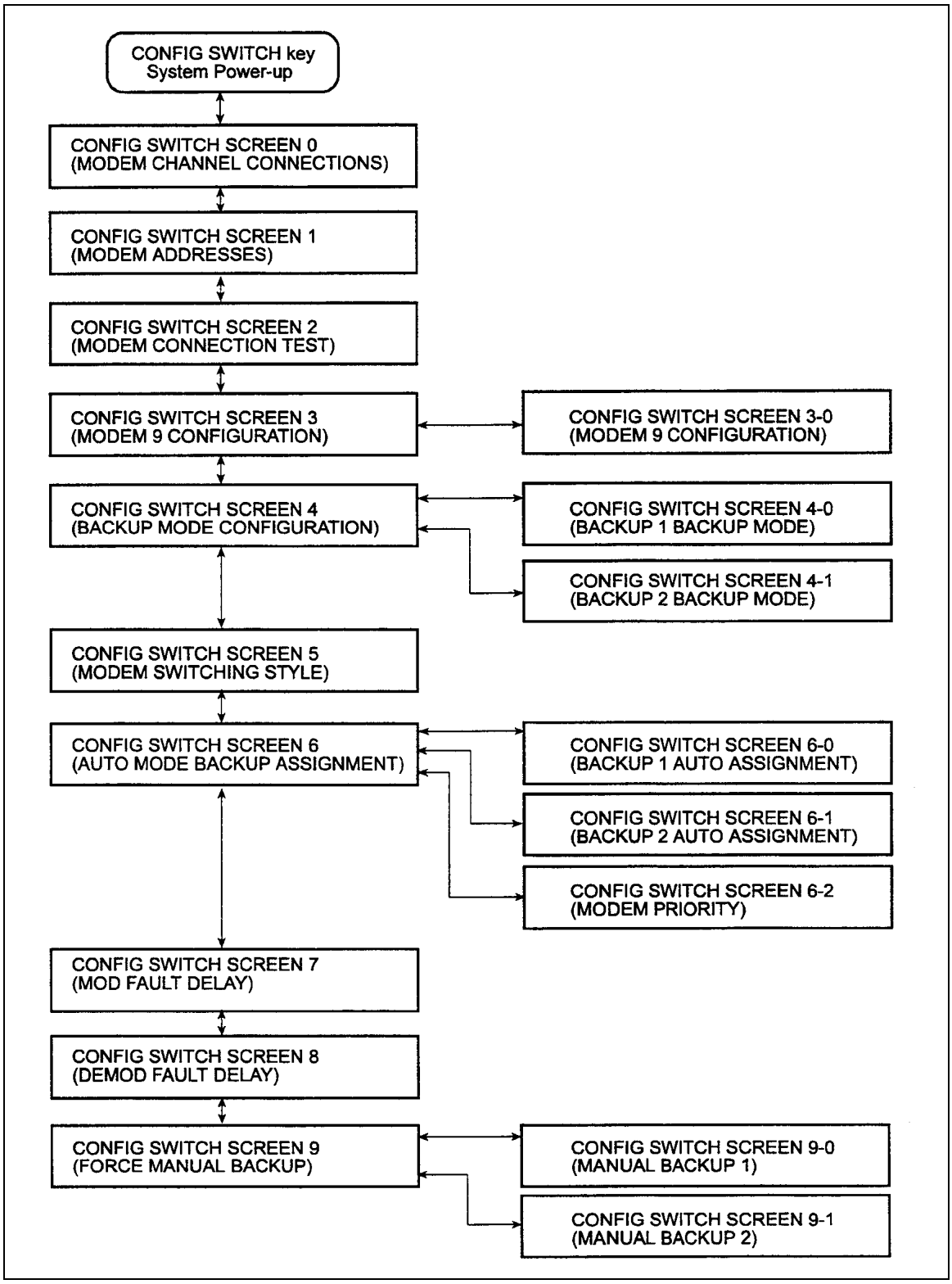

CONFIG SWITCH key
System Power-up
CONFIG SWITCH SCREEN 0
(MODEM CHANNEL CONNECTIONS)
CONFIG SWITCH SCREEN 1
(MODEM ADDRESSES)
CONFIG SWITCH SCREEN 2
(MODEM CONNECTION TEST)
CONFIG SWITCH SCREEN 3
(MODEM 9 CONFIGURATION)
CONFIG SWITCH SCREEN 3-0
(MODEM 9 CONFIGURATION)
CONFIG SWITCH SCREEN 4
(BACKUP MODE CONFIGURATION)
CONFIG SWITCH SCREEN 4-0
(BACKUP 1 BACKUP MODE)
CONFIG SWITCH SCREEN 4-1
(BACKUP 2 BACKUP MODE)
CONFIG SWITCH SCREEN 5
(MODEM SWITCHING STYLE)
CONFIG SWITCH SCREEN 6
(AUTO MODE BACKUP ASSIGNMENT)
CONFIG SWITCH SCREEN 6-0
(BACKUP 1 AUTO ASSIGNMENT)
CONFIG SWITCH SCREEN 6-1
(BACKUP 2 AUTO ASSIGNMENT)
CONFIG SWITCH SCREEN 6-2
(MODEM PRIORITY)
CONFIG SWITCH SCREEN 7
(MOD FAULT DELAY)
CONFIG SWITCH SCREEN 8
(DEMOD FAULT DELAY)
CONFIG SWITCH SCREEN 9
(FORCE MANUAL BACKUP)
CONFIG SWITCH SCREEN 9-0
(MANUAL BACKUP 1)
CONFIG SWITCH SCREEN 9-1
(MANUAL BACKUP 2)

Figure 4-2.

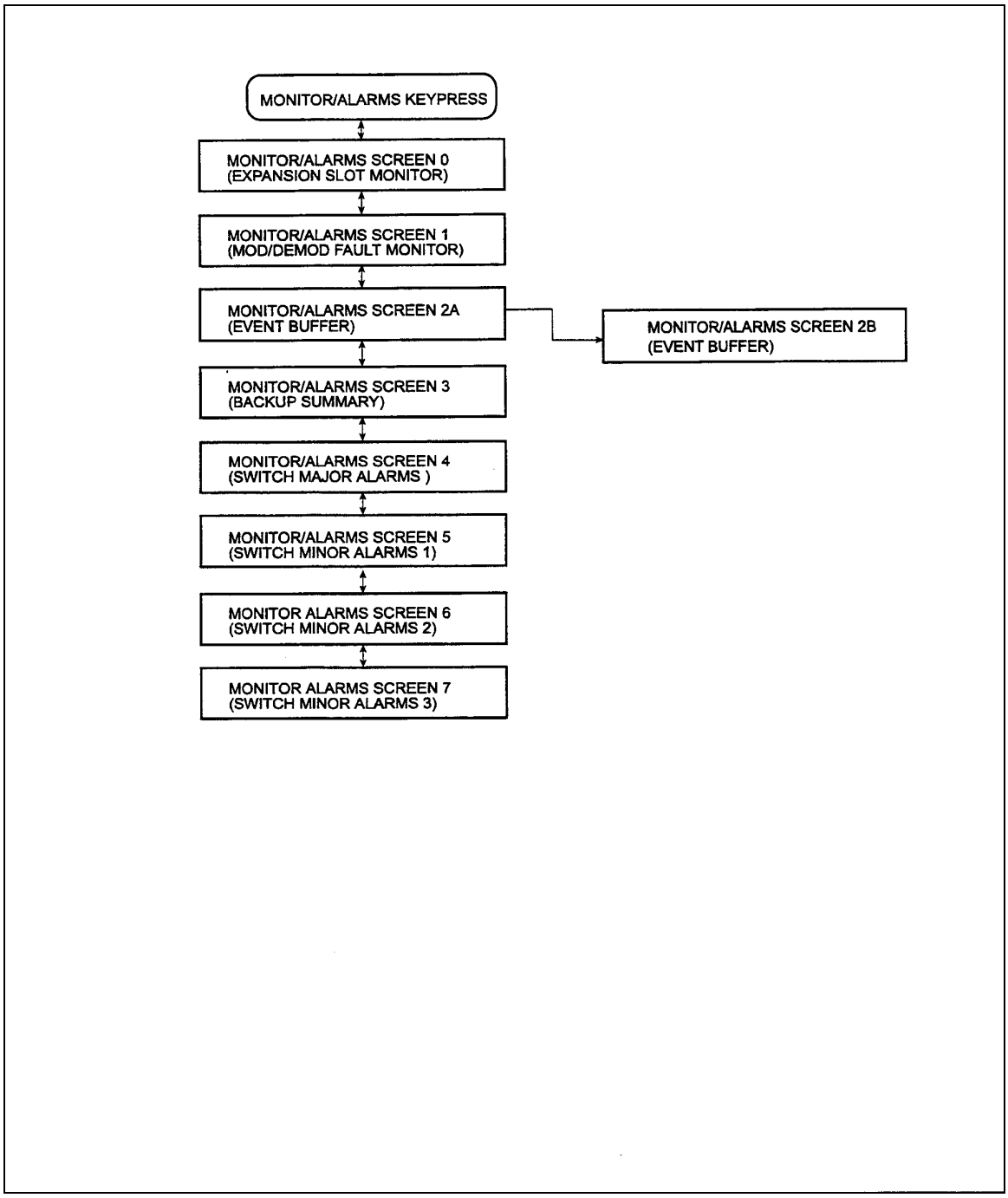

MONITOR/ALARMS KEYPRESS
MONITOR/ALARMS SCREEN 0
(EXPANSION SLOT MONITOR)
MONITOR/ALARMS SCREEN 1
(MOD/DEMOD FAULT MONITOR)
MONITOR/ALARMS SCREEN 2A
(EVENT BUFFER)
MONITOR/ALARMS SCREEN 2B
(EVENT BUFFER)
MONITOR/ALARMS SCREEN 3
(BACKUP SUMMARY)
MONITOR/ALARMS SCREEN 4
(SWITCH MAJOR ALARMS)
MONITOR/ALARMS SCREEN 5
(SWITCH MINOR ALARMS 1)
MONITOR ALARMS SCREEN 6
(SWITCH MINOR ALARMS 2)
MONITOR ALARMS SCREEN 7
(SWITCH MINOR ALARMS 3)

Figure 4-3.

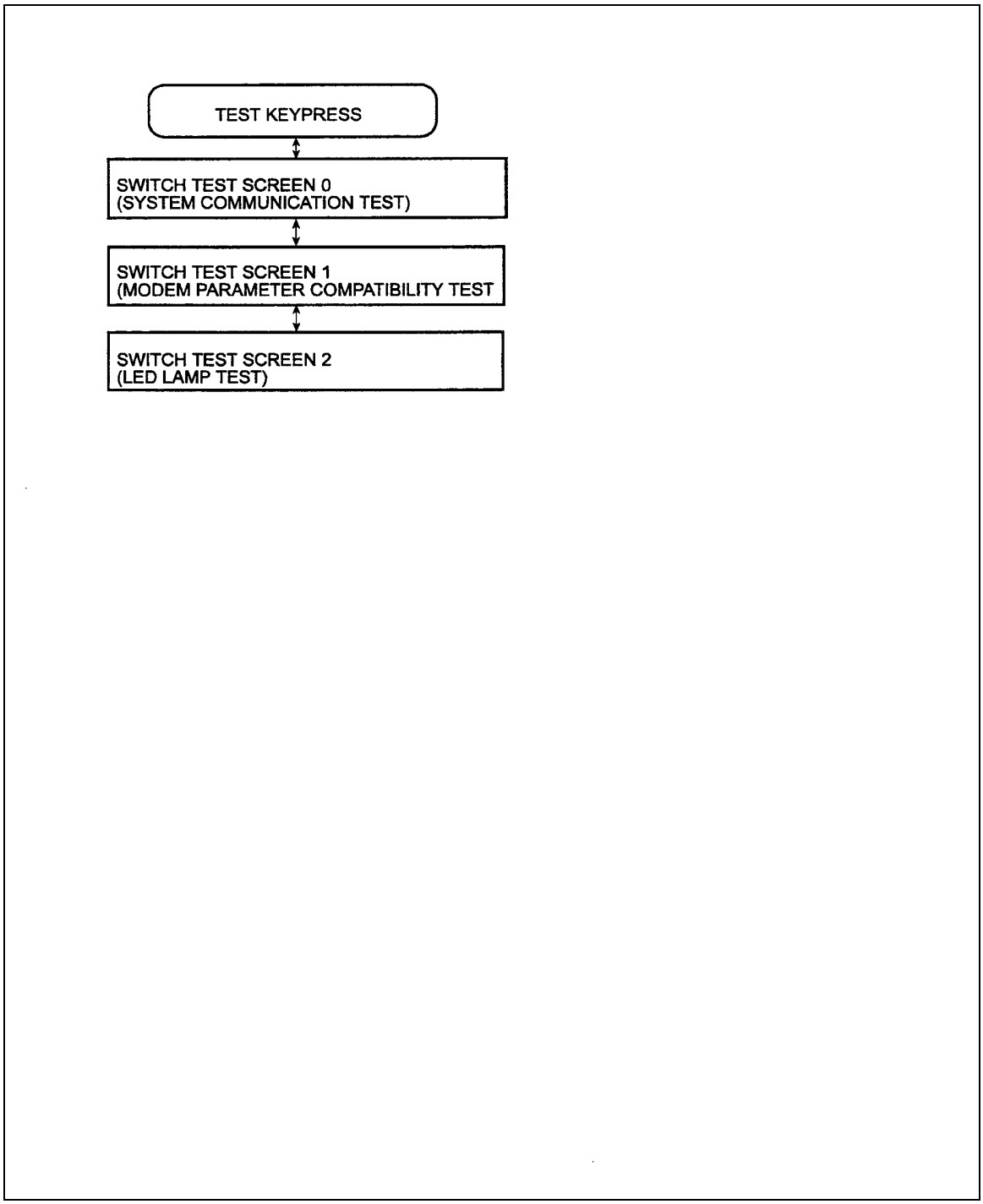

TEST KEYPRESS
SWITCH TEST SCREEN 0
(SYSTEM COMMUNICATION TEST)
SWITCH TEST SCREEN 1
(MODEM PARAMETER COMPATIBILITY TEST
SWITCH TEST SCREEN 2
(LED LAMP TEST)

Figure 4-4.

4.7 Host Computer Remote Communications

Control and status messages are conveyed between the RCS20 and the subsidiary modems and the host computer using packetized message blocks in accordance with a proprietary communications specification. This communication is handled by the Radyne Link Level Protocol (RLLP), which serves as a protocol 'wrapper' for the RM&C data. Complete information on monitor and control software is contained in the Radyne RLLP Protocol Reference Guide.

4.7.1 Protocol Structure

The Communications Specification (COMMSPEC) defines the interaction of computer resident Monitor and Control software used in satellite earth station equipment such as modems, redundancy switches, multiplexers, and other ancillary support gear. Communication is bi-directional, and is normally established on one or more full-duplex 9600 baud multi-drop control buses that conform to EIA Standard RS-485.

Each piece of earth station equipment on a control bus has a unique physical address, which is assigned during station setup/configuration or prior to shipment. Valid decimal addresses on one control bus range from 032 through 255 for a total of up to 224 devices per bus. Address 255 of each control bus is usually reserved for the M&C computer.

4.7.2 Protocol Wrapper

The Radyne COMMSPEC is byte-oriented, with the Least Significant Bit (LSB) issued first. Each data byte is conveyed as mark/space information with two marks comprising the stop data. When the last byte of data is transmitted, a hold comprises one steady mark (the last stop bit). To begin or resume data transfer, a space substitutes this mark. This handling scheme is controlled by the hardware and is transparent to the user. A pictorial representation of the data and its surrounding overhead may be shown as follows:

S1	S2	B_0	B_1	B_2	B_3	B_4	B_5	B_6	B_7	S1	S2, etc.

The stop bits, S1 and S2, are each a mark. Data flow remains in a hold mode until S2 is replaced by a space. If S2 is followed by a space, it is considered a start bit for the data byte and not part of the actual data (B_0 - B_7).

The COMMSPEC developed for use with the Radyne Link Level Protocol (RLLP) organizes the actual monitor and control data within a shell, or "protocol wrapper", that surrounds the data. The format and structure of the COMMSPEC message exchanges are described herein. Decimal numbers have no suffix; hexadecimal numbers end with a lower case h suffix and binary values have a lower case b suffix. Thus, 22 = 16h = 000010110b. The principal elements of a data frame, in order of occurrence, are summarized as follows:

<SYN> - the message format header character, or ASCII sync character, that defines the beginning of a message. The <SYN> character value is always 16h.

<BYTE COUNT> - the Byte Count is the number of bytes in the <DATA> field, ranging from 0 through TBD. This field is 2 bytes long for the DM240 protocol.

<SOURCE ID> - the Source Identifier defines the message originator's multidrop address. Note that all nodes on a given control bus have a unique address that must be defined.

<DESTINATION ID> - The Destination Identifier specifies the multidrop address of the device(s) to which the message is sent.

<FRAME SEQUENCE NUMBER> - The FSN is a tag with a value from 0 through 255 that is sent with each message. It assures sequential information framing and correct equipment acknowledgment and data transfers.

<OPCODE> - The Operation Code field contains a number that identifies the message type associated with the data that follows it. Acknowledgment and error codes are returned in this field. This field is 2 Bytes for the DM240 protocol.

<...DATA...> - The Data field contains the binary, data bytes associated with the <OPCODE>. The number of data bytes in this field is indicated by the <BYTE COUNT> value.

<CHECKSUM> - The checksum is the modulo 256 sum of all preceding message bytes, excluding the <SYN> character. The checksum determines the presence or absence of errors within the message. In a message block with the following parameters, the checksum is computed as shown below in Table 4-4.

Table 4-4. Checksum Calculation Example

BYTE FIELD	DATA CONTENT	RUNNING CHECKSUM
<BYTE COUNT> (Byte 1)	00h = 00000000b	00000000b
<BYTE COUNT> (Byte 2)	02h = 00000010b	00000010b
<SOURCEID>	F0h = 11110000b	11110010b
<DESTINATION ID>	2Ah = 00101010b	00011100b
<FSN>	09h = 00001001b	00100101b
<OPCODE> (Byte 1)	00h = 00000000b	00101000b
<OPCODE> (Byte 2)	03h = 00000011b	00101000b
<DATA> (Byte 1)	DFh = 11011111b	00000111b
<DATA> (Byte 2)	FEh = 11111110b	00000101b

Thus, the checksum is 00000101b; which is 05h or 5 decimal. Alternative methods of calculating the checksum for the same message frame are:

00h + 02h + F0h + 2Ah + 09h + 00h + 03h + DFh + FEh = 305h.

Since the only concern is the modulo 256 (modulo 100h) equivalent (values that can be represented by a single 8-bit byte), the checksum is 05h.

For a decimal checksum calculation, the equivalent values for each information field are:

0 + 2 + 240 + 42 + 9 + 0 + 3 + 223 + 254 = 773;

773/256 = 3 with a remainder of 5. This remainder is the checksum for the frame.

5 (decimal) = 05h = 0101b = <CHECKSUM>

4.7.3 Frame Description and Bus Handshaking

In a Monitor and Control environment, every message frame on a control bus port executes as a packet in a loop beginning with a wait-for-SYN-character mode. The remaining message format header information is then loaded, either by the M&C computer or by a subordinate piece of equipment requesting access to the bus. Data is processed in accordance with the OPCODE, and the checksum for the frame is calculated. If the anticipated checksum does not match then the wait-for-SYN mode goes back into effect. If the OPCODE resides within a command message, it defines the class of action that denotes an instruction that is specific to the device type, and is a prefix to the DATA field if data is required. If the OPCODE resides within a query message packet, then it defines the query code, and can serve as a prefix to query code DATA.

The Frame Sequence Number (FSN) is included in every message packet, and increments sequentially. When the M & C computer or bus-linked equipment initiates a message, it assigns the FSN as a tag for error control and handshaking. A different FSN is produced for each new message from the FSN originator to a specific device on the control bus. If a command packet is sent and not received at its intended destination, then an appropriate response message is not received by the packet originator. The original command packet is then re-transmitted with the same FSN. If the repeated message is received correctly at this point, it is considered a new message and is executed and acknowledged as such.

If the command packet is received at its intended destination but the response message (acknowledgment) is lost, then the message originator (usually the M&C computer) re-transmits the original command packet with the same FSN. The destination device detects the same FSN and recognizes that the message is a duplicate, so the associated commands within the packet are not executed a second time. However, the response packet is again sent back to the source as an acknowledgment in order to preclude undesired multiple executions of the same command.

To reiterate, valid equipment responses to a message require the FSN tag in the command packet. This serves as part of the handshake/acknowledge routine. If a valid response message is absent, then the command is re-transmitted with the same FSN. For a repeat of the same command involving iterative processes (such as increasing or decreasing transmit power level), the FSN is incremented after each message packet. When the FSN value reaches 255, it overflows and begins again at zero.

The full handshake/acknowledgment involves a reversal of source and destination ID codes in the next message frame, followed by a response code in the <OPCODE> field of the message packet from the equipment under control.

4.7.4 Global Response Operational Codes

In acknowledgment (response) packets, the operational code <OPCODE> field of the message packet is set to 0 by the receiving devices when the message intended for the device is evaluated as valid. The device that receives the valid message then exchanges the <SOURCE ID> with the <DESTINATION ID>, sets the <OPCODE> to zero in order to indicate that a good message was received, and returns the packet to the originator. This "GOOD MESSAGE" Opcode is one of nine global responses. Global response Opcodes are common responses, issued to the M&C computer or to another device, that can originate from and are interpreted by all Radyne ComStream, Inc. equipment in the same manner. These are summarized as follows (all Opcode values are expressed in decimal form):

RESPONSE OPCODE DESCRIPTION	OPCODE
Good Message	00h
Bad Parameter	FFh
Bad Opcode	FEh

4.7.5 Collision Avoidance

When properly implemented, the physical and logical devices and ID addressing scheme of the COMMSPEC normally precludes message packet contention on the control bus. The importance of designating unique IDs for each device during station configuration cannot be overemphasized. One pitfall, which is often overlooked, concerns multi-drop override IDs. All too often, multiple devices of the same type are assigned in a direct-linked ("single-thread") configuration accessible to the M&C computer directly. For example, if two DM240 Modulators with different addresses (DESTINATION IDs) are linked to the same control bus at the same hierarchical level, both will attempt to respond to the M&C computer when the computer generates a multi-drop override ID of 23. If their actual setup parameters, status, or internal timing differs, they will both attempt to respond to the override simultaneously with different information, or asynchronously in their respective message packets and response packets, causing a collision on the serial control bus.

To preclude control bus data contention, different IDs must always be assigned to the equipment. If two or more devices are configured for direct-linked operation, then the M&C computer and all other devices configured in the same manner must be programmed to inhibit broadcast of the corresponding multi-drop override ID.

The multi-drop override ID is always accepted by devices of the same type on a common control bus, independent of the actual DESTINATION ID. These override IDs with the exception of “BROADCAST” are responded to by all directly linked devi ces of the same type causing contention on the bus. The “BROADCAST” ID, on the other hand, is accepted by all equipment but none of them returns a response packet to the remote M&C.

The following multi-drop override IDs are device-type specific, with the exception of "BROADCAST". These are summarized below with ID values expressed in decimal notation:

Directly-Addressed Equipment	Multi-Drop Override ID
Broadcast (all directly-linked devices)	00
DMD-3000/4000, 4500 or 5000 Mod Section, DMD15	01
DMD-3000/4000, 4500 or 5000 Demod Section, DMD15	02
RCU-340 1:1 Switch	03
RCS-780 1:N Switch	04
RMUX-340 Cross-Connect Multiplexer	05
CDS-780 Clock Distribution System	06
SOM-340 Second Order Multiplexer	07
DMD-4500/5000 Modulator Section	08
DMD-4500/5000 Demodulator Section	09
RCU-5000 M:N Switch	10
DMD15 Modulator	20
DMD15 Demodulator	21
DMD15 Modem	22
DVB3030 Video Modulator, DM240	23
Reserved for future equipment types	24-31

Note that multi-drop override ID 01 can be used interchangeably to broadcast a message to a DMD-3000/4000 modem, a DMD-4500/5000, a DMD15 modem, or a DVB3030. Radyne ComStream, Inc. recommends that the multi-drop override IDs be issued only during system configuration as a bus test tool by experienced programmers, and that they not be included in run-time software. It is also advantageous to consider the use of multiple bus systems where warranted by a moderate to large equipment complement.

Therefore, if a DMD15 Modulator is queried for its equipment type identifier, it will return a "20" and DMD15 Demodulator will return a "21". A DMD15 Modem will also return an "22". A DVB3030 Video Modulator will return a “23.”

4.7.6 Software Compatibility

The COMMSPEC, operating in conjunction within the RLLP shell, provides for full forward and backward software compatibility independent of the software version in use. New features are appended to the end of the DATA field without OPCODE changes. Older software simply discards the data as extraneous information without functional impairment for backward compatibility.

If new device-resident or M&C software receives a message related to an old software version, new information and processes are not damaged or affected by the omission of data.

The implementation of forward and backward software compatibility often, but not always, requires the addition of new Opcodes. Each new function requires a new Opcode assignment if forward and backward compatibility cannot be attained by other means.

When Radyne ComStream, Inc. equipment is queried for bulk information (Query Mod, Query Demod, etc.) it responds by sending back two blocks of data; a Non-Volatile Section (parameters that can be modified by the user) and a Volatile Section (status information). It also returns a count value that indicates how large the Non-Volatile Section is. This count is used by M&C developers to index into the start of the Volatile Section.

When new features are added to Radyne ComStream, Inc. equipment, the control parameters are appended to the end of the Non-Volatile Section, and status of the features, if any, are added at the end of the Volatile Section. If a remote M&C queries two pieces of Radyne ComStream, Inc. equipment with different revision software, they may respond with two different sized packets. The remote M&C MUST make use of the non-volatile count value to index to the start of the Volatile Section. If the remote M&C is not aware of the newly added features to the Radyne ComStream, Inc. product, it should disregard the parameters at the end of the Non-Volatile Section and index to the start of the Volatile Section.

If packets are handled in this fashion, there will also be backward-compatibility between Radyne ComStream, Inc. equipment and M&C systems. Remote M&C systems need not be modified every time a feature is added unless the user needs access to that feature.

4.7.7 RLLP Summary

The RLLP is a simple send-and-wait protocol that automatically re-transmits a packet when an error is detected, or when an acknowledgment (response) packet is absent.

During transmission, the protocol wrapper surrounds the actual data to form information packets. Each transmitted packet is subject to time out and frame sequence control parameters, after which the packet sender waits for the receiver to convey its response. Once a receiver verifies that a packet sent to it is in the correct sequence relative to the previously received packet, it computes a local checksum on all information within the packet excluding the <SYN> character and the <CHECKSUM> fields. If this checksum matches the packet <CHECKSUM>, the receiver processes the packet and responds to the packet sender with a valid response (acknowledgment) packet.

The response packet is therefore either an acknowledgment that the message was received correctly. If the sender receives a valid acknowledgment (response) packet from the receiver, the <FSN> increments and the next packet is transmitted as required by the sender.

If an acknowledgment (response) packet is lost, corrupted, or not issued due to an error and is thereby not returned to the sender, the sender re-transmits the original information packet; but with the same <FSN>. When the intended receiver detects a duplicate packet, the packet is acknowledged with a response packet and internally discarded to preclude undesired repetitive executions. If the M&C computer sends a command packet and the corresponding response packet is lost due to a system or internal error, the computer times out and re-transmits the same command packet with the same <FSN> to the same receiver and waits once again for an acknowledgment.

4.7.8 RCS20 Opcode Command Set

The RCS20 Opcode Command Set is listed below:

Command	Opcode
Query Identification	2403h
Query Control Mode	2404h
Query Switch Status	2001h
Query Switch Configuration	2002h
Query Switch Modem Remote Addresses	2003h
Query Switch Backup Mode	2004h
Query Switch Expansion Module Config	2005h
Query Reference Distribution Configuration	2010h
Query Switch Time	240Eh
Query Switch Date	240Fh
Query Switch Time and Date	2410h
Command Control Mode	2600h
Command Switch Relay Modem Packet	2200h
Command Switch Configuration	2202h
Command Switch Backup Mode	2204h
Command Switch Clear Alarms	2205h
Command Switch Force Manual Backup	2206h
Command Reference Distribution Configuration	2210h
Command Switch Set Time	2C04h
Command Switch Set Date	2C05h

4.7.9 RCS20 Channel Definitions

The RCS20 organized the modems connected to the switch according to satellite communications channels. These channels are labeled on the DDS20 and IFS20 panels, and are defined as follows:

Channel 0 - Backup 1
Channel 1 - Modem 1
Channel 2 - Modem 2
Channel 3 - Modem 3
Channel 4 - Modem 4
Channel 5 - Modem 5
Channel 6 - Modem 6
Channel 7 - Modem 7
Channel 8 - Modem 8
Channel 9 - Modem 9/Backup 2

4.7.10 Detailed Command Descriptions

Refer to Appendix A

4.8 Ethernet Port User Interface

The Ethernet Port of the DM240 allows for complete control and monitoring of all DM240 parameters and functions via a 10BaseT or 100BaseT Ethernet Connection.

4.9 RCS20 Management Information Base (MIB)

All of the necessary information for the user interface is contained in the DM240 Management Information Base (MIB), which is contained in Appendix B.

4.10 Terminal Port User Interface

The Terminal Port of the DM240 allows for complete control and monitoring of all DM240 parameters and functions via an RS-232 Serial Interface.

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Section 5 – Electrical Interfaces

5.0 RCS20 Connections

All RCS20 connections are made to labeled connectors located on the rear of the unit. Any connection interfacing to the RCS20 must be the appropriate mating connector. Refer to Figures 5-1 through 5-5 for connector locations and Figure 5-6 for the Interconnection Diagram.

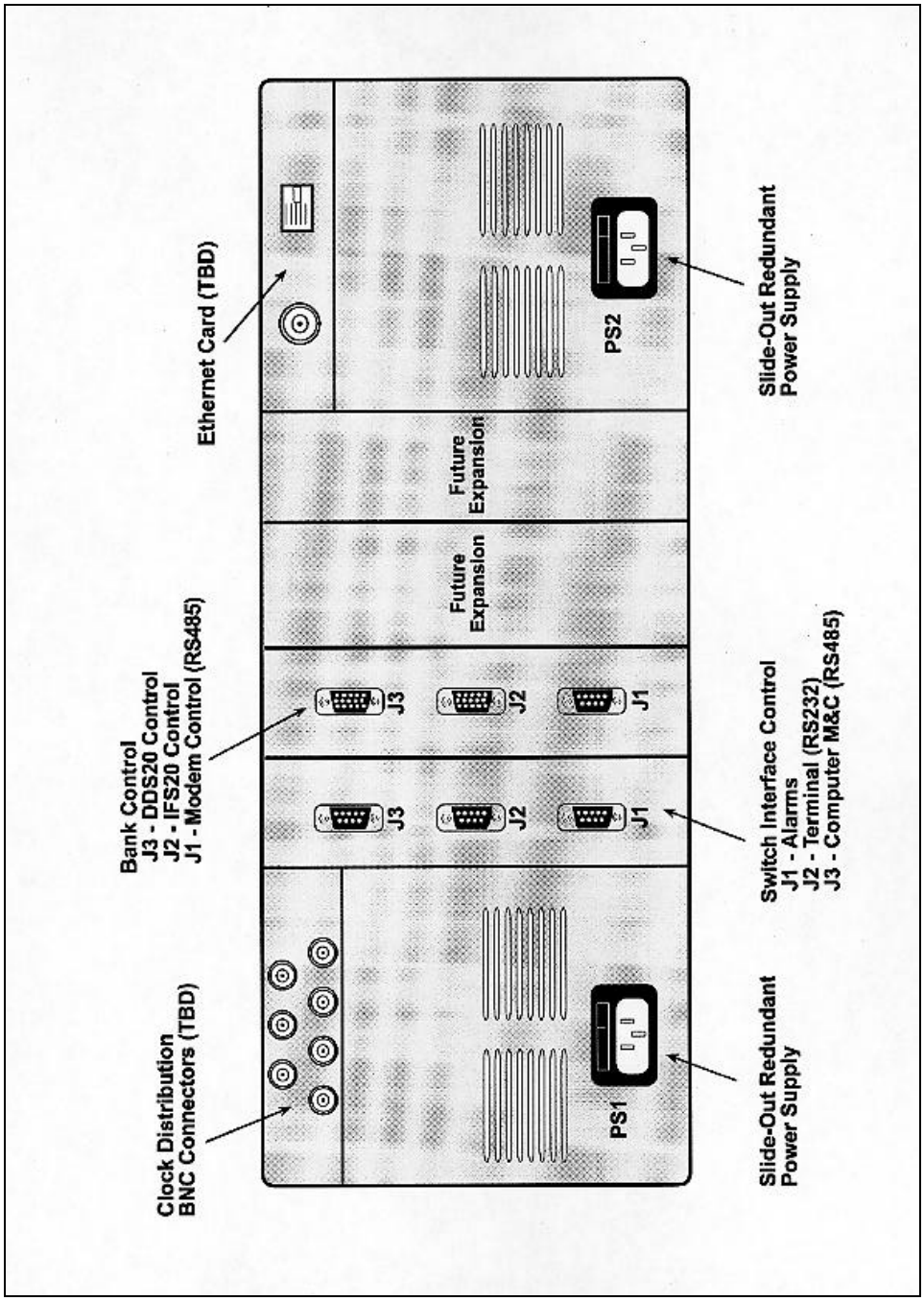


Figure 5-1. RCU20 Rear Panel Connectors

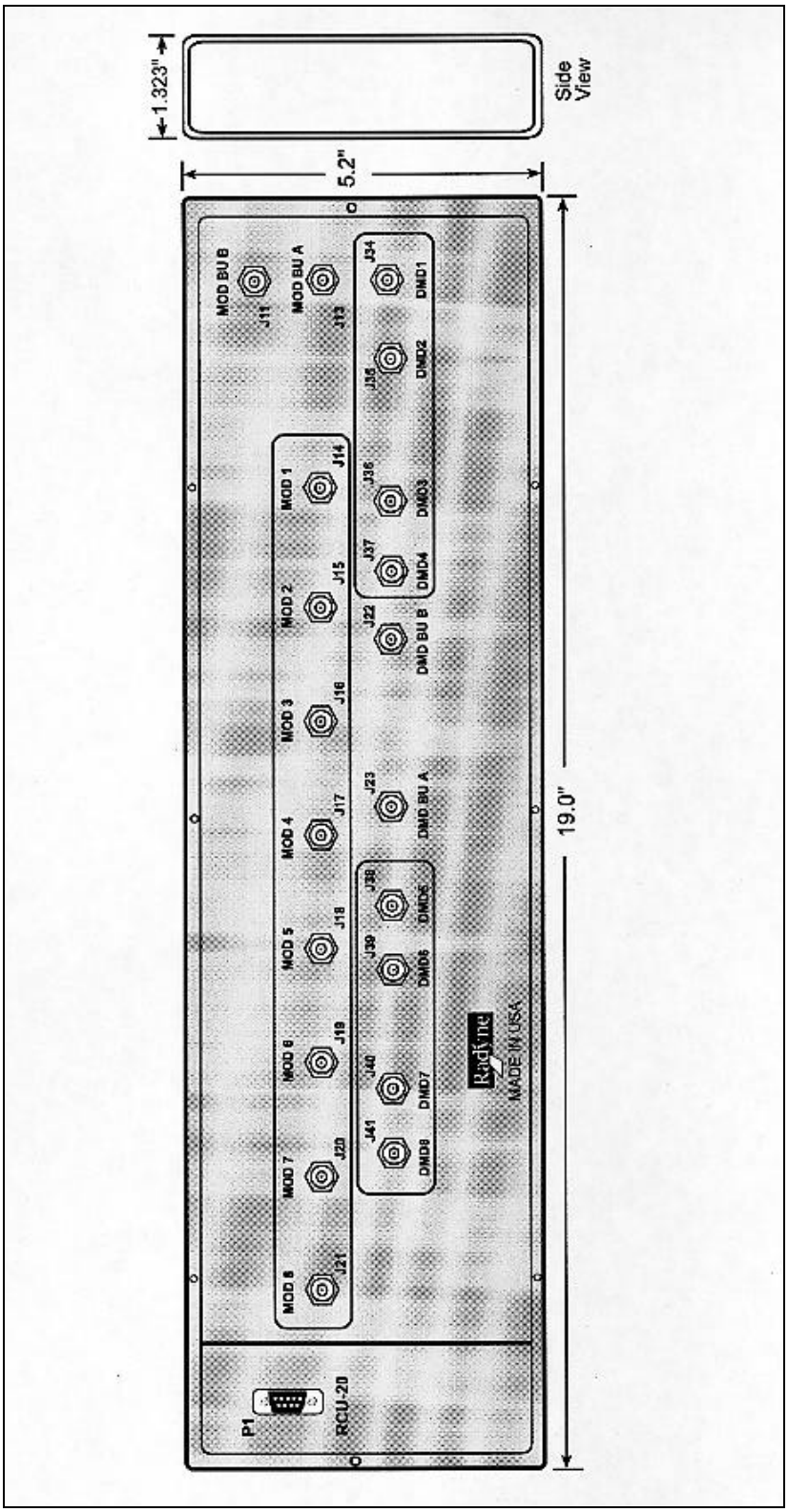


Figure 5-2. IFS20 Rear Panel Connectors

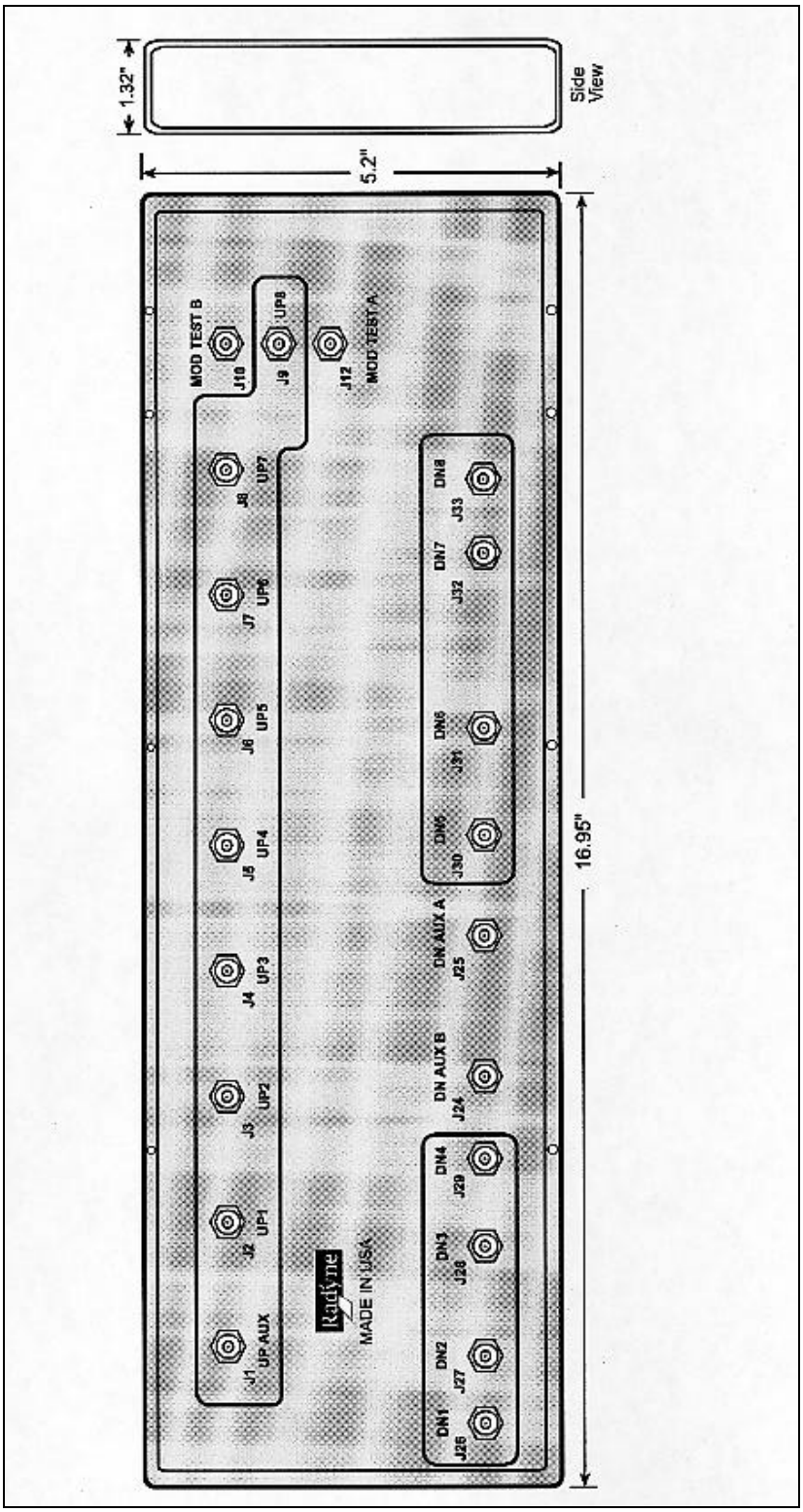
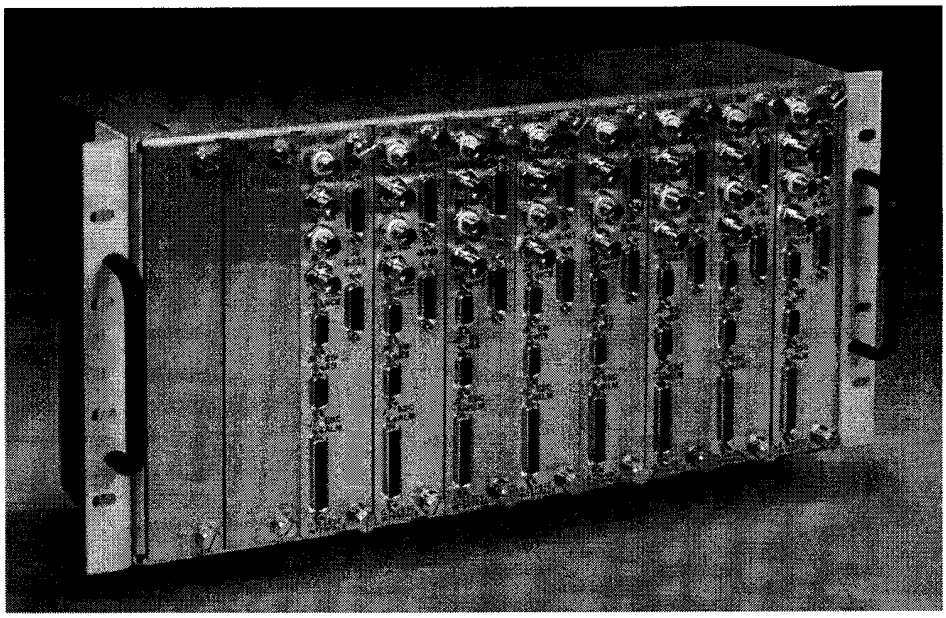


Figure 5-3. IFS20 Chassis Base



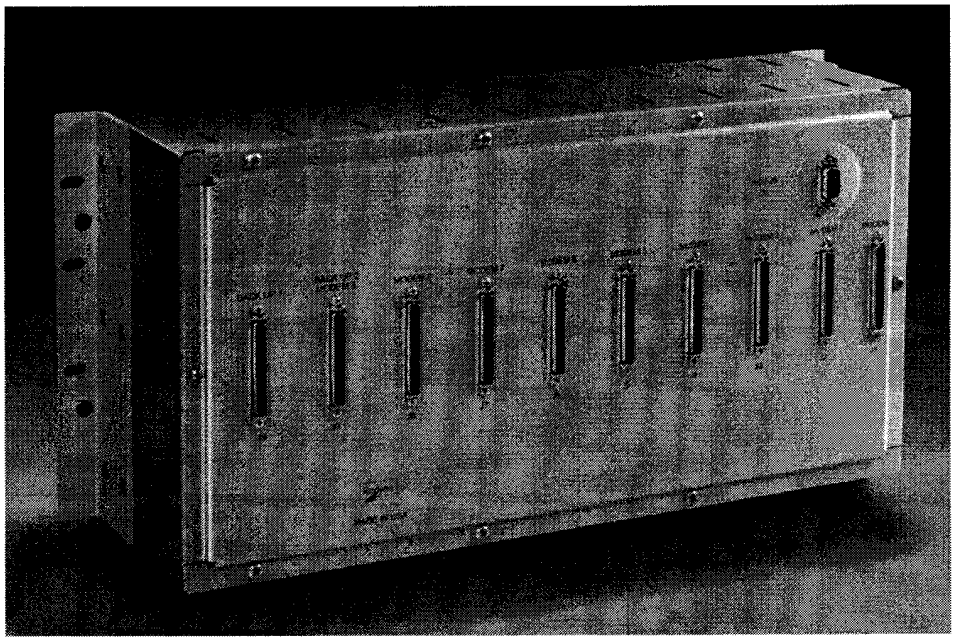


Figure 5-4. DDS20 Front and Rear Panels

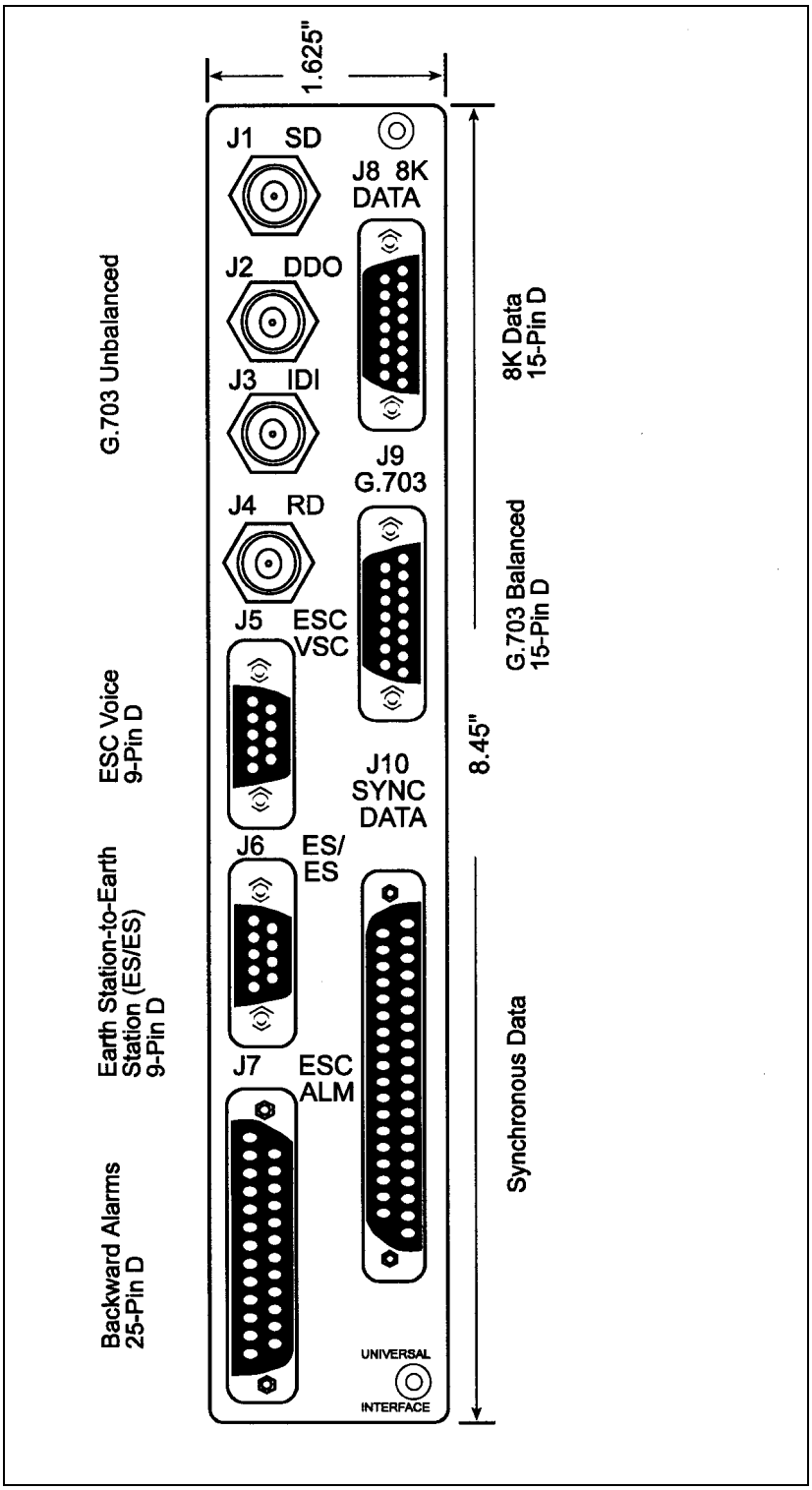


Figure 5-5. Rear Panel Interface – Data Switch Module – DDS20

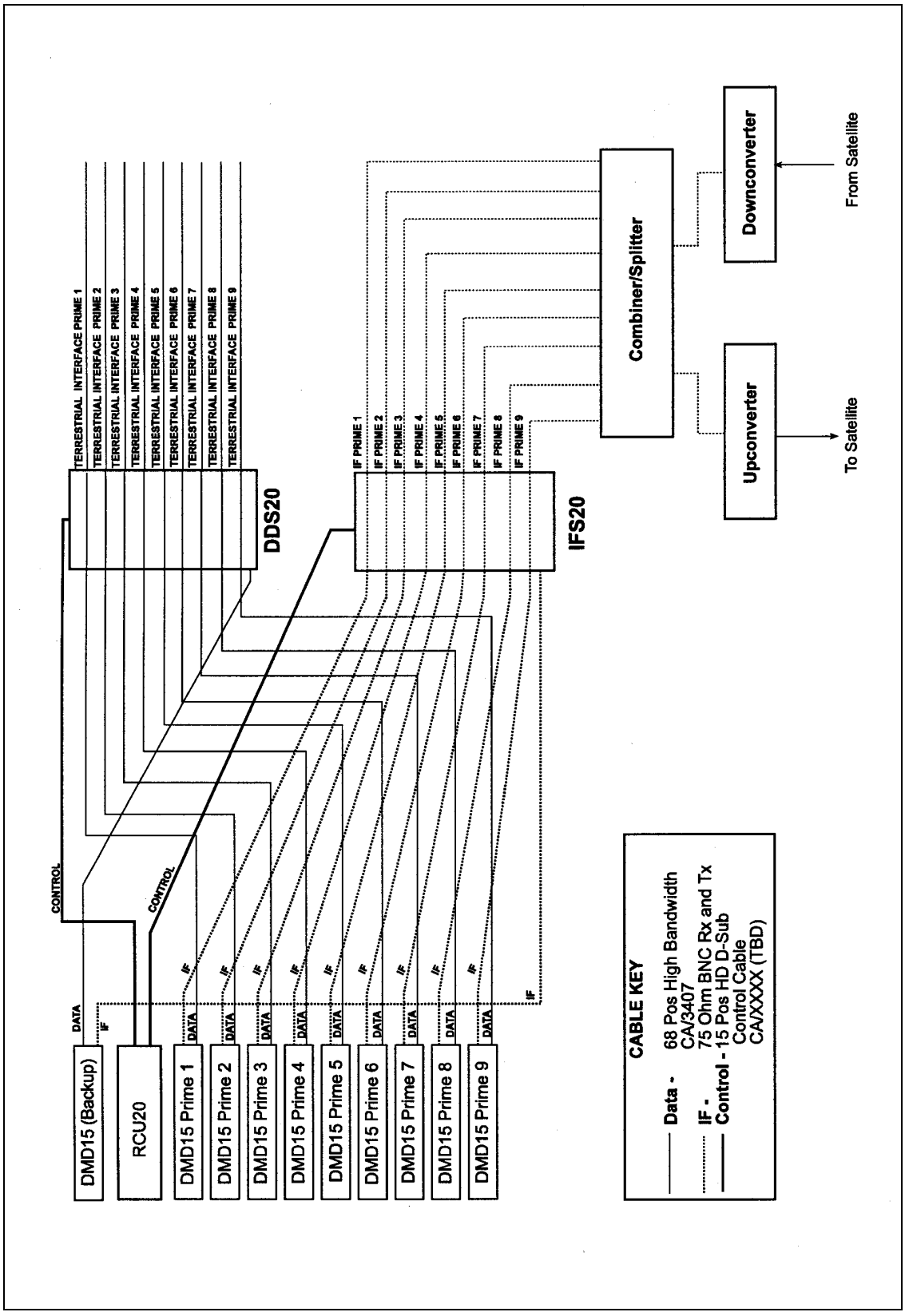
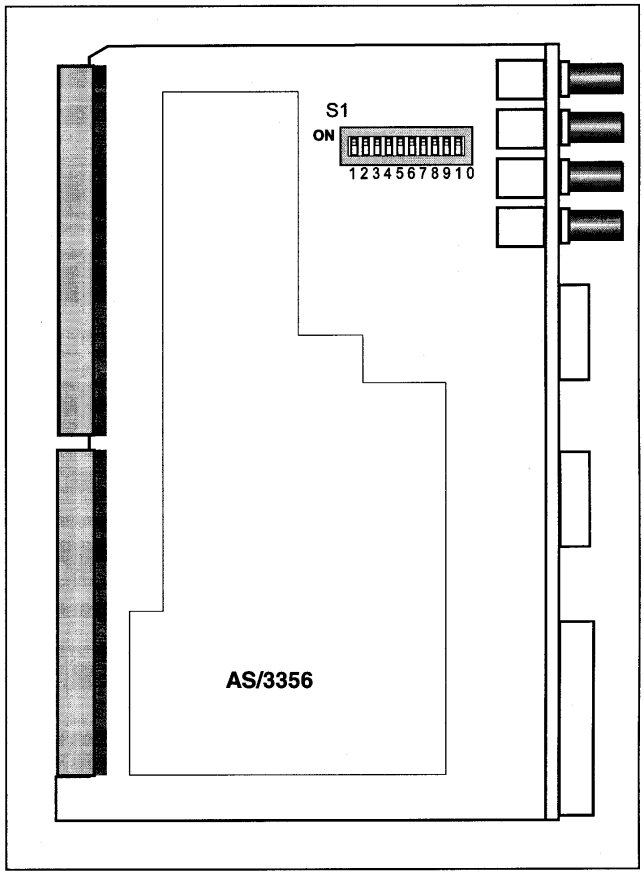


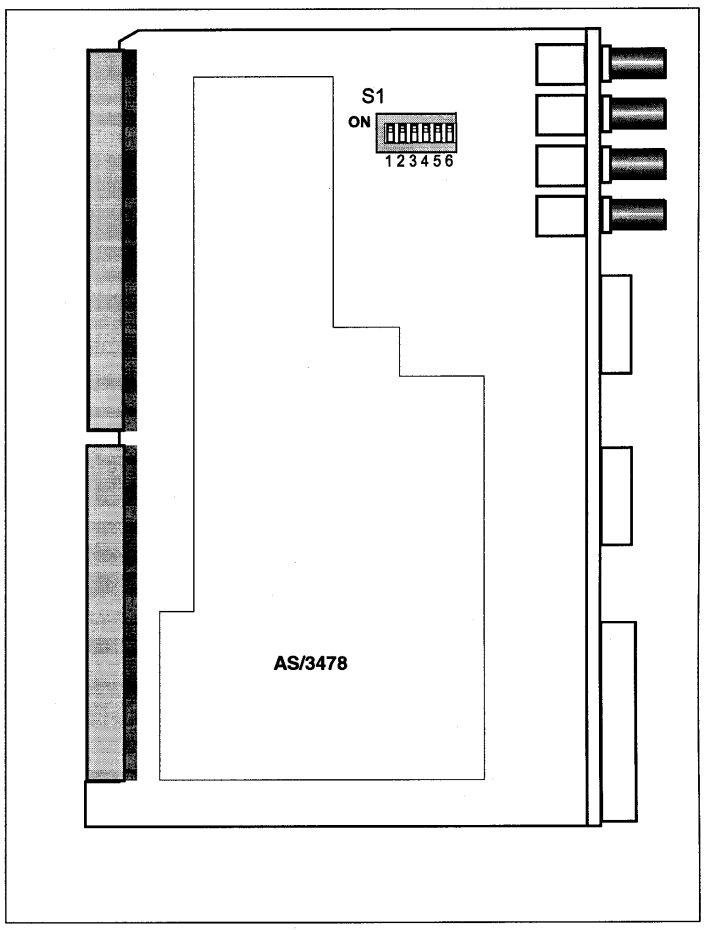
Figure 5-6. RCS20 Cabling and Interconnection Diagram

5.1 DIP Switch Settings

The following Tables represent the DIP Switch settings for G.703 Balanced, G.703 Unbalanced and Synchronous (RS-422/V.35) interfaces located on the Digital Data Switch (DDS20).



AS/3356 G.703 Unbalanced DIP Switch Settings		AS/3356 G.703 Balanced DIP Switch Settings		AS/3356 ALL SYNC (RS422/V.35) DIP Switch Settings	
1	ON	1	ON	1	OFF
2	ON	2	ON	2	OFF
3	ON	3	OFF	3	OFF
4	ON	4	OFF	4	OFF
5	ON	5	OFF	5	OFF
6	ON	6	OFF	6	OFF
7	ON	7	ON	7	OFF
8	ON	8	ON	8	OFF
9	ON	9	OFF	9	OFF
10	ON	10	OFF	10	OFF



AS/3478 G.703 Balanced DIP Switch Settings		AS/3478 G.703 Balanced DIP Switch Settings	
1	ON	1	OFF
2	ON	2	OFF
3	ON	3	OFF
4	ON	4	OFF
5	ON	5	OFF
6	ON	6	OFF

5.2 DDS20 Connector Pinouts

The following connectors are located on the Universal Interface Module on the DDS20. Refer to the following Tables for the connector pinouts.

5.2.1 J1 - SD - Send Data

J1 is the G.703 Unbalanced Send Data (SD) BNC connector located on the Universal Interface Module.

5.2.2 J2 - DDO - Drop Data Out

J2 is the Unbalanced Drop Data Out (DDO) BNC connector located on the Universal Interface Module.

5.2.3 J3 - IDI - Insert Data In

J3 is the Unbalanced Insert Data In (IDI) BNC connector located on the Universal Interface Module.

5.2.4 J4 - RD - Receive Data

J4 is the Unbalanced Receive Data (RD) BNC connector located on the Universal Interface Module.

5.2.5 J5 - ESC Audio

J5 is the 9-pin 'D' Female ESC Audio Channel connector. The pinouts for this connector are shown below in Table 5-1.

Table 5-1. J5 - ESC Audio - 9-Pin 'D' Female

Pin No.	Signal	Description	Direction
1	ESCAUD TX 1A	Tx Audio 1A (-)	Input
2	ESCAUDRX 1A	Rx Audio 1A (-)	Output
3	GND	Ground	None
4	ESCAUDTX 2B	Tx Audio 2B (+)	Input
5	ESCAUDRX 2A	Rx Audio 2A (-)	Output
6	ESCAUDTX 1B	Tx Audio 1B (+)	Input
7	ESCAUDRX 1B	Rx Audio 1B (+)	Output
8	ESCAUDTX 2A	Tx Audio 2A (-)	Input
9	ESCAUDRX 2A	Rx Audio 2A (-)	Output

5.2.6 J6 - ES/ES

The connector pinouts for J6, the 9-Pin Earth Station-to-Earth Station asynchronous data connector are shown Table 5-2.

Table 5-2. J6 - ES/ES - 9-Pin 'D' Female

Pin No.	Signal	Description	Direction
1	GND	Ground	None
2	RXD-232	Receive Data RS232	Output
3	TXD-232	Transmit Data RS232	Input
4	TXD-B	Transmit Data RS485 (+)	Input
5	TXD-A	Transmit Data RS485 (-)	Input
6	NC	No Connection	None
7	NC	No Connection	None
8	RXD-B	Receive Data B RS485 (+)	Output
9	RXD-A	Receive Data A RS485 (-)	Output

Table 5–8.
J7 - ESC Alarm Interface - 25-Pin Female 'D'

Pin Number	Signal	Description	Direction
1	GND	Ground	None
2	ESCBWO 1 NO	Backward Alarm Out-1 NO	None
3	NC	No Connection	None
4	ESCBWO 1 NO	Backward Alarm Out-2 NO	None
5	NC	No Connection	None
6	ESCBWO 4 NO	Backward Alarm Out-4 NO	None
7	GND	Ground	None
8	ESCBWO 4 NO	Backward Alarm Out-4 NO	None
9	NC	No Connect	None
10	ESCBWI 2	Backward Alarm In 2	Input
11	ESCBWI 4	Backward Alarm In 4	Input
12	NC	No Connect	None
13	NC	No Connect	None
14	ESCBWO 1C	Backward Alarm Out 1-C	None
15	ESCBWO 1-NC	Backward Alarm Out 1-NC	None

16	ESCBWO 2-C	Backward Alarm Out 2-C	None
17	ESCBWO 2-NC	Backward Alarm Out 2-NC	None
18	ESCBWO 3-C	Backward Alarm Out 3-C	None
19	ESCBWO 3-NC	Backward Alarm Out 3-NC	None
20	ESCBWO 4-C	Backward Alarm Out 4-C	None
21	ESCBWO 4-NC	Backward Alarm Out 4-NC	None
22	ESCBWI 1	Backward Alarm In 1	Input
23	ESCBWI 1	Backward Alarm In 3	Input
24	NC	No Connection	None
25	NC	No Connect	None

J8 - ESC 8K Data Interface

J8 is the 15-pin ESC IDR 8-Kilobit overhead data connector. The pinouts are shown below.

Table 5-9.

J8 - ESC 8K Data Interface 15-Pin Female 'D' Connector

Pin No.	Signal Name	Signal	Direction
1	ESCRXO-B	Rx Octet-B (+)	Output
2	ESCRXC-B	Rx Clock-B (+)	Output
3	ESCRXD-B	Rx Data-B (+)	Output
4	NC	No Connect	None
5	NC	No Connect	None
6	ESCTXD-A	Tx Data-A (-)	Output
7	ESCTXC-A	Tx Clock-A (-)	Output
8	ESCTXO-A	Tx Octet-A (-)	Output
9	ESCRXO-A	Rx Octet-A (-)	Output
10	ESCRXC-A	Rx Clock-A (-)	Output
11	ESCRXD-A	Rx Data-A (-)	Output
12	GND	Ground	None
13	ESCTXD-B	Tx Data-B (+)	Input
14	ESCTXC-B	Tx Clock-B (+)	Output
15	ESCTXO-B	Tx Octet-B (+)	Output

J9- G.703 (Balanced)

J9 is the G.703 (Balanced) 15-pin data connector. The pinouts are shown below.

Table 5-10.
J9 - G.703 (Balanced) 15-Pin Female 'D' Connector

Pin No.	Signal Name	Signal	Direction
1	Send Data A (-)	SD-A	Input
9	Send Data B (+)	SD-B	Input
7	External Clock A (-)	BAL EXC-A	Input
8	External Clock B (+)	BAL EXC-B	Input
3	Receive Data A (-)	RD-A	Output
11	Receive Data B (+)	RD-B	Output
12	Drop Data Out A (-)	DDO-A	Output
5	Drop Data Out B (+)	DDO-B	Output
13	Insert Data In A (-)/EXC A (-)	IDI-A	Input
6	Insert Data In B (+)/ESC B (+)	IDI-B	Input

J10 - Sync Data

J10 is the 37-pin synchronous data connector located on the Universal Interface Module. The pinouts are shown below in Table 5-11.

Table 5–11.
J10 - Sync Data RS422/RS485/V.35 - 37-Pin Female

Pin Number	Signal	Description	Direction
3	TXO-A	Transmit Octet A (-)	Input
21	TXO-B	Transmit Octet B (+)	Input
4	SD-A	Send Data A (-)	Input
22	SD-B	Send Data B (+)	Input
5	ST-A	Send Timing A (-)	Output
23	ST-B	Send Timing B (+)	Output
6	RD-A	Receive Data A (-)	Output
24	RD-B	Receive Data B (+)	Output
7	RS-A	Request to Send A (-)	Input
25	RS-B	Request to Send B (+)	Input
8	RT-A	Receive Timing A (-)	Output
26	RT-B	Receive Timing B (+)	Output
9	CS-A	Clear to Send A (-)	Output

10	MF	Mod Fault - Open Collector	Output
28	DF	Demod Fault - Open Collector	Output
27	CS-B	Clear to Send B (+)	Output
11	DM-A	Data Mode A (-)	Output
29	DM-B	Data Mode B (+)	Output
13	RR-A	Receiver Ready A (-)	Output
31	RR-B	Receiver Ready B (+)	Output
15	BAL EXC-A	External Clock A (-)	Input
33	BAL EXC-B	External Clock B (+)	Input
16	RX-0-A	Receive Octet A (-)	Output
34	RX-0 B	Receive Octet B (+)	Output
17	TT-A	Terminal Timing A (-)	Input
35	TT-B	Terminal Timing B (+)	Input
1, 19, 20, 37	GND	Signal Ground	

Digital Data Switch (DDS20) J1 through J10 - Switch Connector

J1 through J10 are the 68-Pin high-density data connectors that carry data to and from the modem. The pinouts for these connectors are shown below in Table 5-12.

Table 5-12.

J18 - Switch Connector - 68-Pin High-Density Female

Pin No.	Signal	Description	Direction
1	G.703B SD-A	G.703 Send Data Input A (-)	Input
2	SYNC SD-A	Synchronous Data Send Data Input -A (-)	Input
3	ESCBWO 1C	IDR ESC Backward Alarm Out - 1 Common	None
4	G.703B IDI-A	G.703 Insert Data Input - A (-)	Input
5	SYNC ST-A	Synchronous Data Send Timing Output - A	Output
6	ESCBWO 1NO	IDR ESC Backward Alarm Out - 1 Normally Open	Input
7	SYNC TT-A	Synchronous Data Terminal Timing Input A	Input
8	ESCBWO 2NC	IDR ESC Backward Alarm Out - 2 Normally Closed	
9	DDO-A RT-A	G.703 Drop Data Out A - Synchronous Data Receive Timing Output - A	Output

10	ESCBWO 3C	IDR ESC Backward Alarm Output - 3 Common	
11	IDO-A RD-A	G.703 Insert Data Out A - Synchronous Data Receive Data A	Output
12	ESCBWO 3NO	IDR ESC Backward Alarm Output - 3 Normally Open	
13	BAL EXC-A	External Clock Input - A	Input
14	GND	Ground	
15	ESCAUDTX 1A	IDR ESC Audio Input Channel 1A	Input
16	ESCAUDTX 2A	IDR ESC Audio Input Channel 2A	Input
17	ESCAUD RX 1A	IDR ESC Audio Output Channel 1A	Output
18	ESCAUD RX 2A	IDR ESC Audio Output Channel 2A	Output
19	ESCBWI 3	IDR ESC Backward Alarm Input - 3	Input
20	TXD-A BWI 1	IBS ES Transmit Data A IDR ESC Backward Alarm Input 1	Input
21	MOD FLT	Mod Fault Open Collector Output	Output Open Collector
22	ES RXD-A	IBS ES Receive Data Output - A	Output
23	ES DSR	IBS ES Data Set Ready (RS232 Only)	Output
24	ESCTXC-A	IDR ESC Transmit 8 Kbps Output Clock	Output
25	ESCTXD-A	IDR ESC Transmit 8 Kbps Output Data	Input
26	ESCRXC-A	IDR ESC Receive 8 Kbps Output Clock	Output
27	ESCRXD-A	IDR ESC Receive 8 Kbps Output Data	Output
28	ESCBWO 4NC	IDR ESC Backward Alarm Output - 4 Normally Closed	
29	TXO-A	IBS Transmit Octet Input - A	Input
30	SYNC DM-A	Synchronous Data Mode A	Output
31	SYNC CS-A	Synchronous Data Clear to Send - A	Output
32	RXO-A	IBS Receive Octet Output - A	Output
33	SYNC RS-A	Synchronous Data Request to Send A	Input
34	SYNC RR-A	Synchronous Data Receiver Ready - A	Output
35	G703B SD-B	G.703 Send Data Input - B	Input
36	SYNC SD-B	Synchronous Data Send Data Input - B	Input
37	ESCBWO 1 NC	IDR ESC Backward Alarm Out - 1 Normally Closed	

38	G703B IDI-B	G.703 Insert Data Input - B	
39	SYNC ST-B	Synchronous Data Send Timing Output B	
40	ESCBWO 2C	IDR ESC Backward Alarm Out 2 Common	
41	SYNC TT-B	Synchronous Data Terminal Timing - B	
42	ESCBWO 2NO	IDR ESC Backward Alarm Output 2 Normally Open	
43	DDO-B RT-B	G.703 Drop Data Out - B Synchronous Data Receive Timing B	
44	ESCBWO 3NC	IDR ESC Backward Alarm Out - 3 Normally Closed	
45	IDO-B RD-B	G.703 Insert Data Out Synchronous Data	
46	ESCBWO 4C	IDR ESC Backward Alarm Out - 4 Common	
47	BAL EXC-B	External Clock Input B	Input
48	GND	Ground	
49	ESCAUDTX 1B	IDR ESC Audio Input Channel 1B	Input
50	ESCAUDTX 2B	IDR ESC Audio Input Channel 2B	Input
51	ESCAUDRX 1B	IDR ESC Audio Output Channel 1B	Output
52	ESCAUDRX 2B	IDR ESC Audio Output Channel 2B	Output
53	ESCBWI 4	IDR ESC Backward Alarm Input - 4	
54	TX-B BWI 2	IBS ES Transmit Data B IDR ESC Backward Alarm Input 2	Input
55	DMD FLT	Demod Fault Open Collector Output	Output Open Collector
56	ES RXD-B	IBS ES Receive Data Input - B	Output
57	GND	Ground	
58	ESCTXC-B	IDR ESC Transmit 8 Kbps Output Clock B	Output
59	ESCTXD-B	IDR ESC Transmit 8 Kbps Output Data B	Input
60	ESCRXC-B	IDR ESC Receive 8 Kbps Clock Output B	Output
61	ESCRXD-B	IDR ESC Receive 8 Kbps Data Output B	Output
62	ESCBWO 4NO	IDR ESC Backward Alarm Out - 4 Normally Open	
63	TXO-B	IBS Transmit Octet Input B	Input
64	SYNC DM-B	Synchronous Data - Data Mode Out B	Output
65	SYNC CS-B	Synchronous Data - Clear to Send B	Input
66	RXO-B	IBS Receive Octet Output B	Output

67	SYNC RS-B	Synchronous Data Request to Send - B	Input
68	SYNC RR-B	Synchronous Data Receiver Ready B	Output

RCU20 Connector Pinouts

Table 5-13.
J1 - Switch Interface Control Card - Alarms - 9-pin 'D' Male

Pin No.	Signal	Description	Direction
1	MJA-NC	Major Alarm - NC	None
2	MJA-C	Major Alarm - C	None
3	MJA-NO	Major Alarm - NO	None
4	NC	No Connect	None
5	NC	No Connect	None
6	NC	No Connect	None
7	MNA-NC	Minor Alarm - NC	None
8	MNA-C	Minor Alarm - C	None
9	MNA-NO	Minor Alarm - NO	None

Table 5-14.
J2 - Switch Interface Control Card -
RS232 Terminal Interface - 9-Pin 'D' Female

Pin No.	Signal	Description	Direction
1	NC	No Connect	None
2	RxD	Receive Data	Input
3	TxD	Transmit Data	Output
4	NC	No Connect	None
5	GND	Ground	None
6	NC	No Connect	None
7	NC	No Connect	None
8	NC	No Connect	None
9	NC	No Connect	None

Table 5-15.
J3 - Switch Interface Control Card -
RS485 Remote Interface - 9-Pin 'D' Female

Pin No.	Signal	Description	Direction
1	TxD-B	Transmit Data B (+)	Output
2	NC	No Connect	None
3	NC	No Connect	None
4	NC	No Connect	None
5	COMMON	Signal Common	None
6	TxD-A	Transmit Data A (-)	Output
7	NC	No Connect	None
8	RxD-B	Receive Data B (+)	Input
9	RxD-A	Receive Data A (-)	Input

Table 5-16.
J3 - Switch Interface Control Card -
RS232 Terminal Interface - 9-Pin 'D' Female

Pin No.	Signal	Description	Direction
1	NC	No Connect	None
2	RxD	Receive Data	Input
3	TxD	Transmit Data	Output
4	NC	No Connect	None
5	GND	Ground	None
6	NC	No Connect	None
7	NC	No Connect	None
8	NC	No Connect	None
9	NC	No Connect	None

Table 5-17.
J1 - Bank Control Card -
DDS20 Control and Power - 15-pin HD 'D' Female

Pin No.	Signal	Description	Direction
1	DDS_LCLK	Serial Control Clock	Output
2	VCC_RELAY	Relay +6 Volts	Output
3	DDS_LDAT2	Serial Control Data 2	Bi-directional
4	GND	Ground	None
5	GND	Ground	None
6	VCC	Logic +5 Volts	Output
7	VCC_RELAY	Relay +6 Volts	Output
8	VCC_RELAY	Relay +6 Volts	Output
9	GND	Ground	None
10	GND	Ground	None
11	VCC_RELAY	Relay +6 Volts	Output
12	DDS_LDAT1	Serial Control Data 1	Bi-directional
13	GND	Ground	None
14	DDS_LDAT3	Serial Control Data 3	Bi-directional
15	INT	DDS20 Interrupt	Input

Table 5-18.
J2 - Bank Control Card -
IFS20 Control and Power - 15-pin HD 'D' Female

Pin No.	Signal	Description	Direction
1	IFS_LCLK	Serial Control Clock	Output
2	NC	No Connect	None
3	NC	No Connect	None
4	GND	Ground	None
5	GND	Ground	None
6	VCC	Logic +5 Volts	Output
7	VCC_RELAY	Relay +6 Volts	Output

8	NC	No Connect	None
9	NC	No Connect	None
10	GND	Ground	None
11	VCC_RELAY	Relay +6 Volts	Output
12	IFS_LDAT1	Serial Control Data 1	Bi-directional
13	NC	No Connect	None
14	NC	No Connect	None
15	NC	No Connect	None

Table 5-19.
J3 - Bank Control Card -
RS485 Modem Control - 9-pin 'D' Female

Pin No.	Signal	Description	Direction
1	TxD-B	RS485/HDLC Transmit Data B (+)	Output
2	TCLK-A	HDLC Transmit Clock A (-)	Output
3	TCLK-B	HDLC Transmit Clock B (+)	Output
4	RCLK-A	HDLC Receive Clock A (-)	Input
5	COMMON	Signal Common	None
6	TxD-A	RS485/HDLC Transmit Data A (-)	Output
7	RCLK-B	HDLC Receive Clock B (+)	Input
8	RxD-B	RS485/HDLC Receive Data B (+)	Input
9	RxD-A	RS485/HDLC Receive Data A (-)	Input

Table 5-20.
IFS20, J42 - IFS20 Control and Power
15-pin HD 'D' Female

Pin No.	Signal	Description	Direction
1	IFS_LCLK	Serial Control Clock	Input
2	NC	No Connect	None
3	NC	No Connect	None
4	GND	Ground	None
5	GND	Ground	None

6	VCC	Logic +5 Volts	Input
7	VCC_RELAY	Relay +6 Volts	Input
8	NC	No Connect	None
9	NC	No Connect	None
10	GND	Ground	None
11	VCC_RELAY	Relay +6 Volts	Output
12	IFS_LDAT1	Serial Control Data 1	Bi-directional
13	NC	No Connect	None
14	NC	No Connect	None
15	NC	No Connect	None

Section 6 – Maintenance

6.0 Periodic Maintenance and Troubleshooting

The RCS20 requires no periodic field maintenance procedures. The unit has no adjustments, and all configuration information is digital and stored in nonvolatile EEPROM. Should a unit be suspected of a defect in field operations, the proper procedure is to first to follow the basic troubleshooting guide below. If this does not cure the problem, replace the unit with a known good unit, if available. If the problem persists with the known good unit, faulty wiring or power should be suspected. Only minor repairs will be discussed. For serious failures, the user should not attempt to repair the unit without first contacting Radyne ComStream, Inc. for further information and instructions.

6.1 Troubleshooting

Upon the detection of an operational failure, the source of the failure must be determined. Information on system failures will be contained in the Alarms Display. Basic user checks include checking the power line fuses and the various cables and connectors.

6.1.1 Checking the Cabling and Connectors

Problems that appear difficult to solve can often be traced to a loose or defective cable or connector. As a first check, the user should check all cables within the system for possible breaks or loose connections. Cables that are suspect should be replaced. Also check the jacks on the units for bent or broken pins. Also ensure that both AC power cords are properly plugged into the rear of the RCS20.

6.1.2 Checking the Fuses

The AC power cord that is next to each fuse must be disconnected before the fuse may be removed. To keep the RCS20 operational, be sure to disconnect only one power cord at a time. Also be sure to replace the fuse and the power cord before checking the other fuse.
The AC fuses are located under the fuse cover next to each AC power plug. To remove a fuse, the power cord must first be unplugged so that the cover can be slid away from the fuse and over the AC receptacle. The fuse may now be removed for testing. Test the fuse with an ohmmeter or similar device. if necessary, replace the fuse with a new one of the same size and rating.

Each of the slide-in power supply modules houses AC fuses that are accessible from the rear of the unit. The fuses can be replaced in the field while maintaining redundancy protection for modems connected to the RCS20 by changing the fuses for one power supply at a time. Be sure to replace the fuse with one of the same type and rating. Failure to do so may result In damage to the equipment and may result In a fire hazard.

6.2 RCS20 Alarms

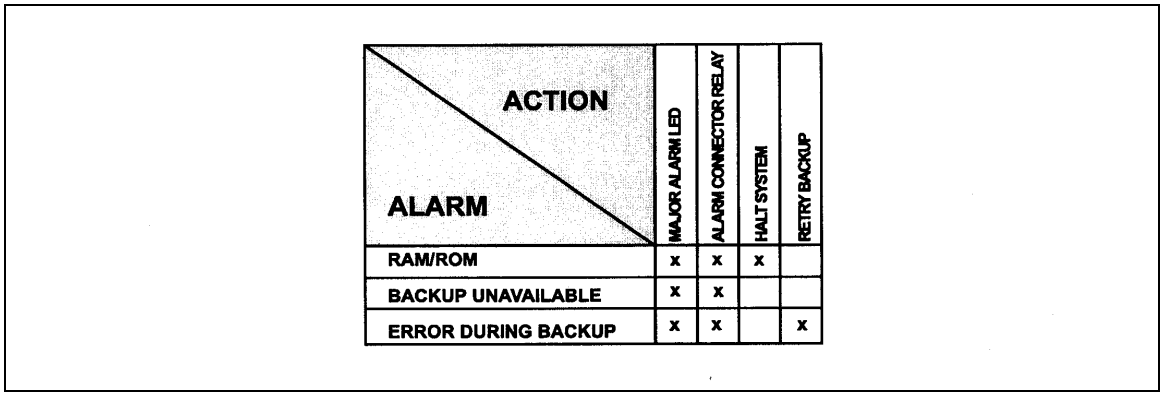
The RCS20 performs extensive self-monitoring and fault isolation as part of its normal operation. Any condition that occurs that in not part of the normal operation of the switch result in an alarm condition, during which the user is notified of the alarm status via the front panel LEDs and the rear panel Alarm connector (J1 on the Switch Interface Module). The alarms are separated into two categories: Major Alarms and Minor Alarms. Refer to Table 6-2 and 6-4 for the Major and Minor Fault Matrices.

6.2.1 Major Alarms

Major Alarms indicate that failure conditions that result in loss of service on one or more primary satellite channels. A major alarm may be caused by an internal switch hardware failure, by failure of one or more modems under redundancy protection, or by an incorrect configuration. A Major Alarm condition is indicated by illumination of the MAJOR ALARM LED on the front panel and by relay closure on the real panel Alarm connector. All conditions resulting in an RCS20 Major Alarm are described in Table 6-1 and a Major Alarm matrix is shown in Table 6-2. The alarm matrix shows all possible alarm conditions, and any actions taken by the RCS20 in response to the alarm.

Table 6-1. RCS20 Major Alarms

RAM/ROM	The RCS20 has detected a failure in either the internal Random Access Memory, or the Read Only Memory. If this alarm persists, the unit must be returned to Radyne, Inc. for repair.
BACKUP UNAVAILABLE	The RCS20 attempted to backup a failed prime channel modem, but no backup channel modem was available because all backup modem channels are currently in use.
ERROR DURING BACKUP	The RCS20 attempted to backup a failed prime channel modem, but there was an error during the backup process that prevented the backup from going on-line.



ALARM \ ACTION	MAJOR ALARM LED	ALARM CONNECTOR RELAY	HALT SYSTEM	RETRY BACKUP
RAM/ROM	x	x	x	
BACKUP UNAVAILABLE	x	x		
ERROR DURING BACKUP	x	x		x

Table 6-2. Major Alarm Matrix

6.2.2 Minor Alarms

Minor Alarms indicate a failure condition that does not immediately result in loss of service on one or more primary satellite channels. However, a minor alarm may indicate that there is a loss of redundancy protection for one or more channels. The RCS20 indicates a Minor Alarm by illuminating the MINOR ALARM LED on the front panel, and closing a relay on the rear panel ALARM connector. All conditions resulting in an RCS20 Minor Alarm are described in Table 6-3 and a Minor Alarm matrix is shown in Table 6-4. The alarm matrix shows all possible alarm conditions, and any actions taken by the RCS20 in response to the alarm.

Table 6-3. RCS20 Minor Alarms	
PS 1 PRESENT	The slide in power supply module in position PS1 is missing or not fully-seated.
PS 1 VOLTAGE	The slide in power supply module in position PS1 is supplying the incorrect voltage.
PS 2 PRESENT	The slide in power supply module in position PS1 is missing or not fully seated.
PS 2 VOLTAGE	The slide in power supply module in position PS1 is supplying the incorrect voltage.
COMMUNICATIONS	One or more of the modems connected to the RCS20 have stopped responding to remote communications from the switch.
FAULTED PRIME	One or more of the modems connected to the RCS20 that are designated as prime channels have failed.
FAULTED BACKUP	One or more of the modems connected to the RCS20 that are designated as backup channels have failed.
CONFIGURATION CHANGE	One or more of the modems connected to the RCS20 that are designated as prime channels have modem configurations that have changed while the RCS20 is in automatic switch mode.
CDM CLOCK SLIP	One or more of the clock outputs on a Clock Distribution Module have lost lock with the external reference.

ACTION / ALARM	MINOR ALARM LED	ALARM CONNECTOR RELAY	RETRY COMMUNICATIONS	REPROGRAM PLL
PS1 PRESENT	x	x		
PS1 VOLTAGE	x	x		
PS2 PRESENT	x	x		
PS2 VOLTAGE	x	x		
COMMUNICATIONS	x	x	x	
FAULTED PRIME	x	x		
FAULTED BACKUP	x	x		
CONFIGURATION CHANGE	x	x		
CDM CLOCK SLIP	x	x		x

Table 6-2. Major Alarm Matrix

6.2.3 Alarm Masks

Each of the Major and Minor Alarms listed above can be 'masked' so that the alarm will *not* result in an indication on the front panel LEDs or the ALARM connector. However, the alarm will be displayed in any of the control modes (Remote, Terminal, or Front Panel). This feature is very helpful during debugging or system testing to lock out a failure that the user is already aware of. The alarm masks may be configured from the Front Panel, the Terminal Port, or the Remote Port.

6.2.4 Latched Alarms

Latched Alarms are used to identify intermittent failures in an RCS20 redundancy system. If an alarm occurs, the alarm condition will be stored even if the condition causing the alarm ceases. Latched alarms can be displayed and cleared from the Front Panel, the Terminal Port, or the Remote Port. Note that latched alarms do not show any indication on the front panel LEDs or ALARM connector. It is recommended that all current and latched alarms be cleared as a final step after all modems and the RCS20 are configured and running.

6.3 Equipment Return and Repair Procedure

The procedure for returning equipment to Radyne, Inc. for repair is as follows:

1. Contact Radyne ComStream, Inc. for a Return Material Authorization (RMA) number.

2. The equipment should be properly packed in its original shipping container, marked with the RMA Number, and shipped to Radyne ComStream, Inc. freight prepaid.

3. Radyne ComStream, Inc. will contact the customer when the equipment arrives at the factory.

4. If the equipment is under warranty, it will be promptly repaired and returned to the user at no charge (the user pays only the freight charge to the factory). If the equipment is out of warranty, it will be promptly repaired. The customer will be charged for repairs and return shipping.

4. Radyne ComStream, Inc. will notify the customer when the equipment is ready to be shipped back to their facility.

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Section 7 – Technical Specifications

7.0 Introduction

This section defines the technical performance parameters and specifications for the RCS20 M:N Redundancy Switch.

7.1 General Specifications

Configurable For:	1:9, 2:8, 1:4/1:4, 1:2/1:6, 1:3/1:5
Online Modulators:	1 to 9
Online Demodulators:	1 to 9
Backup Modulators:	1 to 2
Backup Demodulators:	1 to 2
Uplink Transponders:	1 to 9
Downlink Transponders:	1 to 9
Modes of Operation:	Manual, Automatic, Automatic Revertive and Preemptive
Modulator Switch Time:	250 msec maximum (hot standby), 2.00 sec max (no hot standby)
Demodulator Switch Time:	250 msec max (hot standby), 2.00 sec max + demod lock time (no hot standby)
Modulator Switch Delay Time:	0.0 sec to 299.9 sec, 0.1 sec steps
Demodulator Switch Delay Time:	0.0 sec to 299.9 sec, 0.1 sec steps
IF Switching:	Coaxial, 75O, (50O optional), 20 dB return loss Tx Insertion Loss - 1 dB Nominal Rx Insertion Loss - 3.5 dB Nominal

7.2 Monitor and Control

Terrestrial Interfaces

Universal I/O (UIO):	User-Selectable RS422/449, G.703, V.35, E1 (G.703), E2 (G.703), T1 and T2

The specifications for the interfaces available on the UIO are as follows:

T1:	1.544 Mbps 100O balanced or 75O unbalanced AMI and B8ZS Line Codes
E1:	2.048 Mbps, 120O balanced, or 75O unbalanced HDB3 Line Code.
T2:	6.312 Mbps, 110O balanced, B6ZS Line Code or 75O unbalanced
E2:	8.448 Mbps, 75O BNC unbalanced HDB3 Line Code
ITU V.35:	Differential, Clock and Data Only
RS-422/-449:	All Data Rates, Differential, Clock/Data, DCE

7.3 Options

Clock Distribution Modules, for External Clock.
Cable Sets for DMD15, DMD2400, DVB3000.
ESC Cable Sets
Ethernet Module

7.4 Power and Environmental

Prime Power:	100/240 VAC, 50 - 60 Hz, 65 Watts
Operating Temp:	0 to 50°C, 95% humidity, non-condensing
Storage Temp:	-20 to 70 degrees C, 99% humidity, non-condensing

7.5 Physical

Size:	RCU20 - 19” W x 19” D x 5.25” H
	IFS20 - 19” W x 2” D x 5.25” H
	DDS20 - 19” W x 5” D x 8.75” H
Weight:	RCU20 - 16 lbs. (fully-loaded)
	IFS20 - 5 lbs.
	DDS20 - 20 lbs.

Appendix A – Remote RLLP

When new features are added to Radyne ComStream, Inc. equipment, the control parameters are appended to the end of the Non-Volatile Section of the Remote Communications Specification, and status of the features, if any, are added at the end of the Volatile Section. If a remote M&C queries two pieces of Radyne ComStream, Inc. equipment with different revision software, they could respond with two different sized packets. The remote M&C MUST make use of the non-volatile count value to index to the start of the Volatile Section. If the remote M&C is not aware of the newly added features to the product, it should disregard the parameters at the end of the Non-Volatile Section and index to the start of the Volatile Section.

Before creating any software based on the information contained in this document, contact the Radyne ComStream, Inc. Customer Service Department (602-437-9620) to find out if the software revision for that piece of equipment is current and that no new features have been added since the release of this document.

A.1 Detailed Command Descriptions

Opcode: <2403h> Query RCS20 Device Identification

Query Response		
<1>	Device Identification	24 decimal for RCS20

Opcode: <2404h> Query RCS20 Switch Control Mode

Query Response		
<1>	Control Mode	0 = Front Panel 1 = Terminal Mode 2 = Remote Port

Opcode: <2001h> Query RCS20 Switch Status

Query Response		
<1>	Control Mode	0 = Front Panel 1 = Terminal 2 = Remote Port (Computer RLLP)
<1>	Software Revision	Binary number, decimal point implied
<1>	Number of	10 decimal for RCS20

	Channels	
<1>	Number of Status Bytes per Channels	Maximum number of prime and backup channels available to the RCS20 switch. 3 decimal for RCS20.
<1>	*Channel 0 Status	Bit 0 = modulator failure flag Bit 1 = demodulator failure flag (0 = no failure, 1 = failure) Bit 2 = switch communication in process (0 = no comm in process) (1 = comm in process) Bit 3 = modem responding to switch flag (0 = not responding, 1 = responding) Bit 4 = modulator present (0= not present, 1= present) Bit 5 = demodulator present (0= not present, 1= present)
<1>	*Backed up Modulator	0 = This channel not a backup channel, or this channel is a backup channel but currently not backing up a mod 1 - 9 = This channel currently backing up a mod, channel number as indicated.
<1>	*Backed up Demodulator	0 = This channel not a backup channel, or this channel is a backup channel but currently not backing up a demod. 1 - 9 = This channel currently backing up a Demod, channel number as indicated. ***Note: These 3 bytes repeat for channels 1 - 9 (27 additional bytes used)***
<1>	Switch Major Alarms	Bit 0 = RAM/ROM fault Bit 1 = No Backup for Faulted Prime Bit 2 = Error During Backup (0 = no alarm, 1 = alarm)
<1>	Switch Minor Alarms 1	Bit 0 = Power Supply #1 Present Bit 1 = Power Supply #2 Present Bit 2 = Power Supply #1 Voltage Bit 3 = Power Supply #2 Voltage Bit 4 = Communications Error Bit 5 = Faulted Prime Modem Bit 6 = Faulted Backup Modem Bit 7 = Modem Configuration Change (0 = no alarm, 1 = alarm)
<1>	Switch Minor Alarms 2	Bit 0 = CDM Error Bits 1 - 7: Reserved for future expansion (0 = no alarm, 1 = alarm)
<1>	Latched Switch Major Alarms	Bit 0 = RAM/ROM fault Bit 1 = No Backup for Faulted Prime

		Bit 2 = Error During Backup (0 = no alarm, 1 = alarm)
<1>	Latched Switch Minor Alarms 1	Bit 0 = Power Supply #1 Present Bit 1 = Power Supply #2 Present Bit 2 = Power Supply #1 Voltage Bit 3 = Power Supply #2 Voltage Bit 4 = Communications Error Bit 5 = Faulted Prime Modem Bit 6 = Faulted Backup Modem Bit 7 = Modem Configuration Change (0 = no alarm, 1 = alarm)
<1>	Latched Switch Minor Alarms 2	Bit 0 = CDM Error Bits 1 - 7: Reserved for future expansion (0 = no alarm, 1 = alarm)
<1>	Backup 1 Mod Hot Standby Channel	0 = No hot standby for backup 1 mod
<1>	Backup 1 Demod Hot Standby Channel	Channel number (1 to 9) 0 = No hot standby for backup 1 Demod
<1>	Backup 2 Mod Hot Standby Channel	Channel number (1 to 8) 0 = No hot standby for backup 2 mod, or channel 9 not configured as backup
<1>	Backup 2 Demod Hot Standby Channel	Channel number (1 to 8) 0 = No hot standby for backup 1 Demod, or Channel 9 not configured as backup

Opcode: <2002h> Query RCS20 Switch Configuration

Query Response		
<2>	Nonvolatile Bytes	Number of nonvolatile RCS20 configuration memory bytes (125 decimal for RCS20)
<1>	Number of Channels	Maximum number of prime and backup channels available to the RCS20 switch. 10 decimal for RCS20.
<1>	Nonvolatile Bytes per Channel	Number of nonvolatile memory bytes per channel. 10 decimal for RCS20.
<1>	*Channel 0 Configuration *Channel 0 Mod	Bit 0 = modulator present Bit 1 = demodulator present (0 = not present, 1 = present)

<2>	Backup Delay	0h - BB7h in tenths of a second; decimal point implied
<2>	*Channel 0 Demod Backup Delay	0h - BB7h in tenths of a second; decimal point implied
<1>	*Channel 0 Mod Backup Config	Bit 0 = Backup 1 assigned to this modulator Bit 1 = Backup 2 assigned to this modulator (0 = not assigned, 1 = assigned)
<1>	*Channel 0 Demod Backup Config	Bit 0 = Backup 1 assigned to this demodulator Bit 1 = Backup 2 assigned to this demodulator (0 = not assigned, 1 = assigned)
<1>	*Channel 0 Mod Priority	Channel 0 Modulator backup priority (0 - 9)
<1>	*Channel 0 Demod Priority	Channel 0 Demodulator backup priority (0 - 9)
<1>	*Channel 0 Switch Style	0 = Switch Mod and Demod separately 1 = Switch Mod and Demod together ***Note: These 10 bytes repeat for channels 1 - 9 (uses 90 additional bytes). The Backup Delay applies only to channels 1 - 9 (the four channel 0 bytes are ignored). If channel 9 is configured as backup 2, then the four channel 9 Backup Delay bytes are ignored.***
<1>	Switch Major Alarm Mask	Bit 0 = RAM/ROM fault Bit 1 = No Backup for Faulted Prime Bit 2 = Error During Backup (0 = mask, 1 = allow)
<1>	Switch Minor Alarm 1 Mask	Bit 0 = Power Supply #1 Present Bit 1 = Power Supply #1 Voltage Bit 2 = Power Supply #2 Present Bit 3 = Power Supply #2 Voltage Bit 4 = Communications Error Bit 5 = Faulted Prime Modem Bit 6 = Faulted Backup Modem Bit 7 = Modem Configuration Change (0 = mask, 1 = allow)
<1>	Switch Minor Alarm 2 Mask	Bit 0 = CDM Error Bits 1 - 7: Reserved for future expansion. (0 = mask, 1 = allow)
<1>	Maximum Number of Backup	2 for RCS20

	Channels	
<1>	Nonvolatile bytes per Backup Channel	4 for RCS20
<1>	Backup 1 (Channel 0) Configuration	0 = Backup modem
<1>	Backup 1 (Channel 0) Backup Mode	0 = Manual 1 = Automatic non-revertive 2 = Automatic revertive
<1>	Backup 1 (Channel 0) Force Manual	Channel number for manual backup (1 to 9) Modulator Backup (ignored if in automatic mode)
<1>	Backup 1 (Channel 0) Force Manual	Channel number for manual backup (1 to 9) Demodulator Backup (ignored if in automatic mode)
<1>	Backup 2 (Channel 9) Configuration	0 = Backup modem 1 = Preemptable prime modem 2 = Prime Modem
<1>	Backup 2 (Channel 9) Backup Mode	0 = Manual 1 = Automatic non-revertive 2 = Automatic revertive
<1>	Backup 2 (Channel 0) Force Manual	Channel number for manual backup (1 to 8) Modulator Backup (ignored if in automatic mode or if channel 9 is configured as prime)
<1>	Backup 2 (Channel 0) Force Manual	Channel number for manual backup (1 to 8) Demodulator Backup (ignored if in automatic mode or if channel 9 is configured as prime)
<4>	Reserved	Reserved for RCS10 (= 0 for RCS20)
<4>	Reserved	Reserved for RCS10 (= 0 for RCS20)
	Status Bytes	
<1>	Control Mode	0 = Front Panel 1 = Terminal 2 = Remote Port (Computer RLLP)
<1>	Software Revision	Binary number, decimal point implied
<1>	Number of Channels	Maximum number of prime and backup channels available to the RCS20 switch. (10 decimal for RCS20).

<1>	Number of Status Bytes per Channels	3 decimal for RCS20.
<1>	*Channel 0 Status	Bit 0 = modulator failure flag Bit 1 = demodulator failure flag (0 = no failure, 1 = failure) Bit 2 = switch communication in process (0 = no comm in process) (1 = comm in process) Bit 3 = modem responding to switch flag (0 = not responding, 1 = responding) Bit 4 = modulator DDS module present (0= not present, 1= present) Bit 5 = demodulator DDS module present (0= not present, 1= present)
<1>	*Backed up Modulator	0 = This channel not a backup channel, or this channel is a backup channel but currently not backing up a mod 1 - 9 = This channel currently backing up a mod, channel number as indicated.
<1>	*Backed up Demodulator	0 = This channel not a backup channel, or this channel is a backup channel but currently not backing up a demod. 1 - 9 = This channel currently backing up Demod, channel number as indicated. ***Notes: These 3 bytes repeat for channels 1 - 9 (27 additional bytes used)***
<1>	Switch Major Alarms	Bit 0 = RAM/ROM fault Bit 1 = No Backup for Faulted Prime Bit 2 = Error During Backup (0 = no alarm, 1 = alarm)
<1>	Switch Minor Alarms 1	Bit 0 = Power Supply #1 Present Bit 1 = Power Supply #1 Voltage Bit 2 = Power Supply #2 Present Bit 3 = Power Supply #2 Voltage Bit 4 = Communications Error Bit 5 = Faulted Prime Modem Bit 6 = Faulted Backup Modem Bit 7 = Modem Configuration Change (0 = mask, 1 = allow)
<1>	Switch Minor Alarms 2	Bits 1 - 7: Reserved for future expansion (0 = no alarm, 1 = alarm)
<1>	Latched Switch Major Alarms	Bit 0 = RAM/ROM fault Bit 1 = No Backup for Faulted Prime Bit 2 = Error During Backup

		(0 = no alarm, 1 = alarm)
<1>	Latched Switch Minor Alarms 1	Bit 0 = Power Supply #1 Present Bit 1 = Power Supply #1 Voltage Bit 2 = Power Supply #2 Present Bit 3 = Power Supply #2 Voltage Bit 4 = Communications Error Bit 5 = Faulted Prime Modem Bit 6 = Faulted Backup Modem Bit 7 = Modem Configuration Change (0 = mask, 1 = allow)
<1>	Latched Switch Minor Alarms 2	Bit 0 = CDM Error Bits 1 - 7: Reserved for future expansion (0 = no alarm, 1 = alarm)
<1>	Backup 1 Mod Hot Standby Channel	Channel number (1 to 9) 0 = No hot standby for backup 1 mod
<1>	Backup 1 Demod Hot Standby Channel	Channel number (1 to 9) 0 = No hot standby for backup 1 Demod
<1>	Backup 2 Mod Hot Standby Channel	Channel number (1 to 8) 0 = No hot standby for backup 2 mod, or channel 9 not configured as backup
<1>	Backup 2 Demod Hot Standby Channel	Channel number (1 to 8) 0 = No hot standby for backup 1 Demod, or Channel 9 not configured as backup

Opcode: <2003h> Query RCS20 Switch Modem Addresses

Query Response		
<1>	Number of Channels	Maximum number of prime and backup channels available to the RCS20 switch. 10 decimal for RCS20.
<1>	*Modem Address	Modem remote address for channel 0. **** Note: This 1 byte repeats for channels 1 - 9 (uses 9 additional bytes). If a channel is not configured, then address 0 decimal is returned.***

Opcode: <2004h> Query RCS20 Backup Mode

Query Response		
<1>	Maximum Number of Backup Channels	2 for RCS20

<1>	Backup 1 (Channel 0) Backup Mode	0 = Manual 1 = Automatic non-revertive 2 = Automatic revertive
<1>	Backup 2 (Channel 9) Backup Mode	0 = Manual 1 = Automatic non-revertive 2 = Automatic revertive (Ignore if Channel 9 is not configured as backup)

Opcode: <2005h> Query RCS20 Expansion Module Information

Query Response		
<1>	Number of Expansion Slots	6 for RCS20 Each slot returns one byte as follows: 255 decimal = no expansion card present 0 = RCS20 Interface Control Module 1 = RCS20 Bank Control Module 2 = RCS20 Ethernet Interface Module 3 = RCS20 Clock Distribution Module
<1>	Slot 0 Expansion Card Type	
<1>	Slot 1 Expansion Card Type	
<1>	Slot 2 Expansion Card Type	
<1>	Slot 3 Expansion Card Type	
<1>	Slot 4 Expansion Card Type	
<1>	Slot 5 Expansion Card Type	

Opcode: <240Eh> Query time

Query Response		
<1>	Hour	0 - 23
<1>	Minute	0 - 59
<1>	Second	0 - 59

Opcode: <240Fh> Query date

Query Response		
<1>	Year	0 - 99

<1>	Month	0 - 11
<1>	Day	0 - 30

Opcode: <2410h> Query time and date

Query Response		
<1>	Year	0 - 99
<1>	Month	0 - 11
<1>	Day	0 - 30
<1>	Hour	0 - 23
<1>	Minute	0 - 59
<1>	Second	0 - 59

Opcode: <2600h> Set RCS20 Switch Control Mode

<1>	Control Mode	0 = Front Panel 1 = Terminal 2 = Remote Port (Computer RLLP)

Opcode: <2200h> Relay Command or Query to Modem

<1>	Channel Number	Channel number for the modem for which the message is to be relayed (0 to 9 for the RCS20)
<n>	RLLP Packet from Modem	Complete, addressed RLLP message block with (variable number of bytes) sync byte, source address, destination address, Opcode, byte count, data field and checksum. Contents of Response Packet Data Field: dependent upon message relayed to modem.

Opcode: <2202h> Set RCS20 Configuration

<2>	Nonvolatile Bytes	Number of nonvolatile RCS20 configuration memory bytes (117 decimal for RCS20)
<1>	Number of Channels	Maximum number of prime and backup channels available to the RCS20 switch. (10 decimal) for RCS20.
<1>	Nonvolatile Bytes per Channel	Number of nonvolatile memory bytes per channel (10 decimal for RCS20)
<1>	*Channel 0 Configuration	Bit 1 = modulator present Bit 2 = demodulator present (0 = not present, 1 = present)
<2>	*Channel 0 Mod Backup Delay	0h - BB7h in tenths of a second; decimal implied

<2>	*Channel 0 Demod Backup Delay	0h - BB7h in tenths of a second; decimal implied
<1>	*Channel 0 Mod Backup Configuration	Bit 0 = Backup 1 assigned to this modulator Bit 1 = Backup 2 assigned to this modulator (0 = not assigned, 1 = assigned)
<1>	*Channel 0 Demod Backup Config	Bit 0 = Backup 1 assigned to this demodulator Bit 1 = Backup 2 assigned to this demodulator (0 = not assigned, 1 = assigned)
<1>	*Channel 0 Mod Priority	Channel 0 Modulator backup priority (0 to 9)
<1>	*Channel 0 Demod Priority	Channel 0 Demodulator backup priority (0 to 9)
<1>	*Channel 0 Switch Style	0 = Switch Mod and Demod separately 1 = Switch Mod and Demod together ***Note: These 10 bytes repeat for channels 1 - 9 (uses 90 additional bytes). The Backup Delay applies only to channels 1 - 9 (the four channel 0 bytes are ignored). If channel 9 is configured as backup 2, then the four channel 0 Backup Delay bytes are ignored.***
<1>	Switch Major Alarm Mask	Bit 0 = RAM/ROM fault Bit 1 = No Backup for Faulted Prime (0 = mask, 1 = allow)
<1>	Switch Minor Alarm 1 Mask	Bit 0 = Power Supply #1 Present Bit 1 = Power Supply #2 Present Bit 2 = Power Supply #1 Voltage Bit 3 = Power Supply #2 Voltage Bit 4 = Communications Error Bit 5 = Faulted Prime Modem Bit 6 = Faulted Backup Modem Bit 7 = Modem Configuration Change (0 = mask, 1 = allow)
<1>	Switch Minor Alarm 2 Mask	Bit 0 = Power Supply #1 Present (0 = mask, 1 = allow)
<1>	Maximum Number of Backup Channels	2 for RCS20
<1>	Nonvolatile Bytes per Backup Channel	4 for RCS20

<1>	1 (Channel 0) Configuration	0 = backup modem
<1>	1 (Channel 0) Backup Mode	0 = manual 1 = automatic non-revertive 2 = automatic revertive
<1>	Backup 1 (Channel 0) Force Manual	Channel number for manual backup (1 to 9) Modulator Backup (ignored if in automatic mode)
<1>	Backup 1 (Channel 0) Force Manual	Channel number for manual backup (1 to 9) Demodulator Backup (ignored if in automatic mode)
<1>	Backup 2 (Channel 9) Configuration	0 = backup modem 1 = preemptable prime modem 2 = prime modem
<1>	Backup 2 (Channel 9) Backup Mode	0 = manual 1 = automatic non-revertive 2 = automatic revertive
<1>	Backup 2 (Channel 0) Force Manual	Channel number for manual backup (1 to 8) Modulator Backup (ignored if in automatic mode or if channel 9 is configured as prime)
<1>	Backup 2 (Channel 0) Force Manual	Channel number for manual backup (1 to 8) Demodulator Backup (ignored if in automatic mode or if channel 9 is configured as prime)
<4>	Reserved	Reserved for RCS10 (values will be ignored for RCS20)
<4>	Reserved	Reserved for RCS10 (values will be ignored for RCS20)

Opcode: <2204h> Set RCS20 Backup Mode

<1>	Maximum Number of Backup Channels	2 for RCS20
<1>	Backup 1 (Channel 0) Backup Mode	0 = Manual 1 = Automatic non-revertive 2 = Automatic revertive
<1>	Backup 2 (Channel 9) Backup Mode	0 = Manual 1 = Automatic non-revertive 2 = Automatic revertive (Will be ignored if Channel 9 is not configured as backup)

Opcode: <2205h> Clear RCS20 Alarms

There is no data field for this command.

Opcode: <2206h> Force RCS20 Manual Backup

<1>	Maximum Number of Backup Channels	2 for RCS20
<1>	Backup 1 (Channel 0)	1 to 8 (if Channel 9 configured as backup) 1 to 9 (if Channel 9 not configured as backup)
<1>	Channel to Backup	
<1>	Backup 2 (Channel 9) Backup Mode	1 to 8
		Notes: ***1. Command will return an error if Backup 1 and Backup 2 are forced to backup the same channel.*** ***2. Set channel = 255 decimal if no forced backup is desired for either backup channel.*** ***3. Command will return an error if trying to force a backup for a backup channel not configured in manual backup mode.***

Opcode: <2010h> Query RCS20 Reference Distribution Module Configuration

<1>	RDM Slot Number	Slot number on the RCU20 for the RDM to be configured
<1>	RDM Status	Bit 0 = Ext A Activity Bit 1 = Ext B Activity Bit 2 = Internal Ref. Activity
<1>	RDM Fallback Selection	0 = External A Only 1 = Internal Only 2 = Ext A → Int 3 = Int → Ext A 4 = Ext A → Ext B 5 = Ext A → Ext B → Int 6 = Int → Ext A → Ext B
<1>	RDM Internal Reference Frequency	0 = 10 MHz 1 = 5 MHz 2 = 2.5 MHz 3 = 1.25 MHz
<1>	RDM Currently Selected Source	0 = External A 1 = External B 2 = Internal

Opcode: <2210h> Set RCS20 Frequency Distribution Module Configuration

<1>	RDM Slot Number	Slot number on the RCU20 for the FDM to be configured.
<1>	RDM Fallback Mode	0 = External A Only 1 = Internal Only 2 = Ext A → Int 3 = Int → Ext A 4 = Ext A → Ext B 5 = Ext A → Ext B → Int 6 = Int → Ext A → Ext B
<1>	RDM Internal Reference Frequency	0 = 10 MHz 1 = 5 MHz 2 = 2.5 MHz 3 = 1.25 MHz

Opcode: <2C04h> Command set time

<1>	Hour	0 - 23
<1>	Minute	0 - 59
<1>	Second	0 - 59

Opcode: <2C05h> Command set date

<1>	Year	0 - 99
<1>	Month	0 - 11
<1>	Day	0 - 30

Opcode: <2C06h> Command set time and date

<1>	Year	0 - 99
<1>	Month	0 - 11
<1>	Day	0 – 30
<1>	Hour	0 - 23
<1>	Minute	0 - 59
<1>	Second	0 - 59

RADYNE
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Appendix B – SNMP MIB

```
-- ____________________________________________________________________________
--  $RCSfile: hsmmib.txt $
--  $Revision: 1.8 $
--          $Date: 2001/06/06 13:56:23 $
--  $Author: edarosa $
--
-- Module Organization :
--     This is a PRILIMINARY document whose contents are subject to change
--     without prior notice.
--     Radyne user MIB Object Identifiers description. The private enterprise
--     number 2591 is a unique identifier assigned to Radyne by the Internet
--     Assigned Numbers Authority (IANA). This number is used to uniquely
--     define vendor specific information such as private MIBs.
--
-- Program Units       : (list of program units)
--
-- Requirements Trace  : (document(s) and paragraph reference)
--
-- Deviations          : (any deviations from the coding standard)
--
-- Revision History    : adapted from 3030/3030L usermib
-- ____________________________________________________________________________


RADYNE-MIB DEFINITIONS ::= BEGIN

        IMPORTS
                enterprises
                FROM RFC1155-SMI
                OBJECT-TYPE
                        FROM RFC-1212;

        -- groups in Radyne specific MIB

        radyne     OBJECT IDENTIFIER ::= { enterprises 2591 }
        dvb3030  OBJECT IDENTIFIER ::= { radyne 1 }
        radSNMP_Mod_NV_Status OBJECT IDENTIFIER ::= { dvb3030 1 }
        radSNMP_Mod_Status    OBJECT IDENTIFIER ::= { dvb3030 2 }

        radCarrierControl OBJECT-TYPE
                SYNTAX  INTEGER {
                        off(0),
                        on(1)
                }
                ACCESS  read-write
                STATUS  current
                DESCRIPTION
                        "Turns carrier on and off"
                ::= { radSNMP_Mod_NV_Status 1 }

        radTransmitPower OBJECT-TYPE
                SYNTAX  INTEGER (-300..50)
                ACCESS  read-write
                STATUS  current
                DESCRIPTION
                        "Selects the Tx power level in tenths of dBm
                        from +5.0 to -20.0 (70/140MHz),
                        from -5.0 to -30.0 (L-Band).
```

```
                There is an implied decimal point. For example, a value
                of 39 represents a transmit power level of +3.9 dBm."
        ::= { radSNMP_Mod_NV_Status 2 }

radIFFrequency OBJECT-TYPE
        SYNTAX  INTEGER (50000000..180000000)
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "Selects IF frequency in Hz."
        ::= { radSNMP_Mod_NV_Status 3 }

radDataRate OBJECT-TYPE
        SYNTAX  INTEGER (0..238000000)
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "Selects the data rate in bps.  Note: Changing data rate will
                affect symbol rate, see comment at the end of mibtext."
        ::= { radSNMP_Mod_NV_Status 4 }

radSymbolRate OBJECT-TYPE
        SYNTAX  INTEGER (0..68000000)
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "Selects the symbol rate in sps."
        ::= { radSNMP_Mod_NV_Status 5 }

radSymbolRateMode OBJECT-TYPE
        SYNTAX  INTEGER {
                variable(0),
                fixed(1)
        }
        ACCESS  read-write
        STATUS  optional
        DESCRIPTION
                "Selects symbol rate mode. This can only be modified if the factory
                configuration is set to both variable and fixed.
                This is obsolete."
        ::= { radSNMP_Mod_NV_Status 6 }

radStrapCode OBJECT-TYPE
        SYNTAX  INTEGER (0..65535)
        ACCESS  read-write
        STATUS  optional
        DESCRIPTION
                "The strap code is a quick set key that sets many modem parameters.
                Not implemented."
        ::= { radSNMP_Mod_NV_Status 7 }

radConvolutionalEncoder OBJECT-TYPE
        SYNTAX  INTEGER {
                none(0),
                viterbi1_2(1),
                viterbi2_3(2),
                viterbi3_4(3),
                viterbi5_6(4),
                viterbi7_8(5),
                viterbi6_7(6),
                viterbi8_9(7),
```

```
        }
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "Selects Tx code rate and type.
                Note: Changing the convolutional encoder will affect symbol rate and
                data rate. See note at the end of this section.
                Unsupported choices include:
                        none
                        viterbi6_7
                "
        ::= { radSNMP_Mod_NV_Status 8 }

radClockControl OBJECT-TYPE
        SYNTAX  INTEGER {
                scte(0),
                sct(1),
                none(2),
        }
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "Selects Tx clock source. 0 selects terrestrial clock
                (SCTE), 1 selects internal clock (SCT). Modulators using ASI or G.703
                interface options must use SCTE at all times."
        ::= { radSNMP_Mod_NV_Status 9 }

radFramingMode  OBJECT-TYPE
        SYNTAX  INTEGER {
                framing_DirecTv  (4)
        }
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "Selects the frame transport stream input type.
                Note: Changing the framing mode will affect the symbol rate and/or data
                rate. See note at the end of this section."
        ::= { radSNMP_Mod_NV_Status 10 }

radRolloff OBJECT-TYPE
        SYNTAX  INTEGER {
                rolloff_0_35 (0),
                rolloff_0_2  (1),
                rolloff_0_25 (25)
        }
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "0   selects alpha factor rolloff of 0.35,
                '1'  selects alpha factor rolloff of 0.2,
                '25' selects alpha factor rolloff of 0.25"
        ::= { radSNMP_Mod_NV_Status 11}

radFreqReferenceSource OBJECT-TYPE
        SYNTAX  INTEGER {
                internal(0),
                external(1)
        }
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
```

```
                "Selects internal or external reference clock"
        ::= { radSNMP_Mod_NV_Status 12 }

radExternalReference OBJECT-TYPE
        SYNTAX  INTEGER (1000000..10000000)
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "Selects the external reference frequency in 8 KHz steps."
        ::= { radSNMP_Mod_NV_Status 13 }

radInterfaceType OBJECT-TYPE
        SYNTAX  INTEGER {
                none(10),
                directv(11),
        }
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "Selects the various interface types.
                The following choices are not supported:
                        none(10),

                Note: Selecting interface types Parallel DVB, Parallel M2P, Serial
                DirecTv or HSSI will force the outclock selection to SCT. Selecting
                interface type ASI Norm or ASI Null causes the outclock selection to
                be forced to None.
                "
        ::= { radSNMP_Mod_NV_Status 14 }

radClockPolarity OBJECT-TYPE
        SYNTAX  INTEGER {
                normal(0),
                inverted(1)
        }
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "Selects clock polarity for Tx terrestrial clock relative to Tx data."
        ::= { radSNMP_Mod_NV_Status 15 }

radDataPolarity OBJECT-TYPE
        SYNTAX  INTEGER {
                normal(0),
                inverted(1)
        }
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "Selects data polarity"
        ::= { radSNMP_Mod_NV_Status 16}

radSpectrum OBJECT-TYPE
        SYNTAX  INTEGER {
                inverted(0),
                normal(1)
        }
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "Inverts the symbol mapping direction of rotation."
```

```
            ::= { radSNMP_Mod_NV_Status 17 }

radModulationType OBJECT-TYPE
            SYNTAX  INTEGER {
                        qpsk(0),
                        bpsk(1),
                        psk8(2),
                        qam16(3)
            }
            ACCESS  read-write
            STATUS  current
            DESCRIPTION
                        "Selects the modulation type.
                        Note: Changing modulation type will affect the symbol rate and data rate.
                        See note at the end of this section."
            ::= { radSNMP_Mod_NV_Status 18}

radFraming OBJECT-TYPE
            SYNTAX  INTEGER {
                        dvb(0)
            }
            ACCESS  read-write
            STATUS  optional
            DESCRIPTION
                        "Selects framing type.
                        Reserved"
            ::= { radSNMP_Mod_NV_Status 19 }

radReedsolomon OBJECT-TYPE
            SYNTAX  INTEGER {
                        disable(0)
                        enable(1)
            }
            ACCESS  read-write
            STATUS  current
            DESCRIPTION
                        "Enables the ReedSolomon encoder. Reserved"
            ::= { radSNMP_Mod_NV_Status 20 }

radScramblerControl OBJECT-TYPE
            SYNTAX  INTEGER {
                        disable(0),
                        enable(1)
            }
            ACCESS  read-write
            STATUS  current
            DESCRIPTION
                        "Enables scrambler operation"
            ::= { radSNMP_Mod_NV_Status 21 }

radScramblerType OBJECT-TYPE
            SYNTAX  INTEGER {
                        dvb(0)
            }
            ACCESS  read-write
            STATUS  optional
            DESCRIPTION
                        "Selects scrambler type.
                        Not implemented"
            ::= { radSNMP_Mod_NV_Status 22 }
```

```
radDifferentialEncoder OBJECT-TYPE
        SYNTAX  INTEGER {
                off(0)
        }
        ACCESS  read-write
        STATUS  optional
        DESCRIPTION
                "Disables differential encoder
                unsupported
                "
        ::= { radSNMP_Mod_NV_Status 23 }

radAlarmMaskEnable OBJECT-TYPE
        SYNTAX  INTEGER {
                disable(0),
                enable(1)
        }
        ACCESS  read-write
        STATUS  optional
        DESCRIPTION
                "unsupported"
        ::= { radSNMP_Mod_NV_Status 24 }

radMajorAlarmMask OBJECT-TYPE
        SYNTAX  INTEGER (0..255)
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "Major Alarm mask:
                Bit 1 = Oversample Clock PLL Lock
                Bit 2 = FPGA Configuration Error
                Bit 3 = Synthesis Clock PLL Lock
                Bit 4 = External Reference PLL Lock
                "
        ::= { radSNMP_Mod_NV_Status 25 }

radMinorAlarmMask OBJECT-TYPE
        SYNTAX  INTEGER (0..255)
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "Minor Alarm mask:
                Bit 1 = Terrestrial clock activity detect
                Bit 2 = Tx data activity detect
                Bit 3 = Interleaver FIFO empty error
                Bit 5 = Loss of frame synchronization
                "
        ::= { radSNMP_Mod_NV_Status 26 }

radCommonAlarmMask OBJECT-TYPE
        SYNTAX  INTEGER (0..255)
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "Common Alarm mask:
                Bit 0 = -12V alarm.
                Bit 1 = +12V alarm.
                Bit 2 = +5V  alarm.
                "
        ::= { radSNMP_Mod_NV_Status 27 }
```

```
radOperatingMode OBJECT-TYPE
        SYNTAX  INTEGER {
                normal(0),
                test_pattern_2_15(1)
        }
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "Test Pattern Operating Mode:
                None,
                (2^15)-1
                "
        ::= { radSNMP_Mod_NV_Status 28 }

radCarrierTest OBJECT-TYPE
        SYNTAX  INTEGER {
                off(0),
                cw(1),
                dual(2),
                offset(3),
                posfir(4),
                negfir(5)
        }
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "off, turns carrier off
                cw, causes the modulator to output pure carrier
                dual, causes a double sideband output
                offset, causes a single side band output
                posfir, uses a positive FIR
                negfir, uses a negative FIR"
        ::= { radSNMP_Mod_NV_Status 29 }

radCircuitID OBJECT-TYPE
        SYNTAX  OCTET STRING (SIZE (11))
        ACCESS  read-write
        STATUS  optional
        DESCRIPTION
                "Provides entry of Tx circuit identifier. Circuits can be given up
                to 11 character alphanumeric identity such as LINK1.
                Not implemented."
        ::= { radSNMP_Mod_NV_Status 30 }

radControlMode OBJECT-TYPE
        SYNTAX  INTEGER {
                local(0),
                terminal(1),
                computer(2),
                ethernet(3)
        }
        ACCESS  read-write
        STATUS  optional
        DESCRIPTION
                "Selects the active control source.
                This is obsolete."
        ::= { radSNMP_Mod_NV_Status 31 }

radMode  OBJECT-TYPE
        SYNTAX  INTEGER {
                directv(9)
```

```
                }
                ACCESS  read-write
                STATUS  current
                DESCRIPTION
                        "Selects the network specification."
                ::= { radSNMP_Mod_NV_Status 32 }

        radInterleaver  OBJECT-TYPE
                SYNTAX  INTEGER {
                        enable(0),
                        disable(1)
                }
                ACCESS  read-write
                STATUS  current
                DESCRIPTION
                        "Enables or disables the interleaver."
                ::= { radSNMP_Mod_NV_Status 33 }

        radOutClockSelection  OBJECT-TYPE
                SYNTAX  INTEGER {
                        scte(0),
                        sct(1),
                        none(2),
                }
                ACCESS  read-write
                STATUS  current
                DESCRIPTION
                        "Selects the source of clock output from the Terrestrial Interface.
                        See the Clock Source Selection Matrix."
                ::= { radSNMP_Mod_NV_Status 34 }

        radLastRateControl  OBJECT-TYPE
                SYNTAX  INTEGER {
                        symbol(0),
                        data(1),
                        auto(2)
                }
                ACCESS  read-write
                STATUS  current
                DESCRIPTION
                        "Allows the modulator to behave with symbol rate or data rate
                        precedence based on the selection.
                        See rate control notes."
                ::= { radSNMP_Mod_NV_Status 35 }


--------------------------------------------------------------------------
-- Status information out of Radyne specific MIB

        radMajorAlarmStatus OBJECT-TYPE
                SYNTAX  INTEGER (0..255)
                ACCESS  read-only
                STATUS  current
                DESCRIPTION
                        "Major Alarm status:
                        A bit field. 0 = PASS, 1 = FAIL
                        Bit 1 = Oversample Clock PLL Lock
                        Bit 2 = FPGA Configuration Error
                        Bit 3 = Synthesis Clock PLL Lock
                        Bit 4 = External Reference PLL Lock
                        "
```

```
            ::= { radSNMP_Mod_Status 1 }

radMinorAlarmStatus OBJECT-TYPE
            SYNTAX  INTEGER (0..255)
            ACCESS  read-only
            STATUS  current
            DESCRIPTION
                        "Minor Alarm status:
                        A bit field. 0 = PASS, 1 = FAIL
                        Bit 1 = Terrestrial clock activity detect
                        Bit 2 = Tx data activity detect
                        Bit 3 = Interleaver FIFO empty error
                        Bit 5 = Loss of frame synchronization
                        "
            ::= { radSNMP_Mod_Status 2 }

radCommonAlarmStatus OBJECT-TYPE
            SYNTAX  INTEGER (0..255)
            ACCESS  read-only
            STATUS  current
            DESCRIPTION
                        "Common Alarm status:
                        A bit field. 0 = PASS, 1 = FAIL
                        Bit 0 = -12V alarm.
                        Bit 1 = +12V alarm.
                        Bit 2 = +5V  alarm.
                        "
            ::= { radSNMP_Mod_Status 3 }

radLatchedMajorAlarmStatus OBJECT-TYPE
            SYNTAX  INTEGER (0..255)
            ACCESS  read-only
            STATUS  current
            DESCRIPTION
                        "Major Alarm latched status:
                        A bit field. 0 = PASS, 1 = FAIL
                        Bit 1 = Oversample Clock PLL Lock
                        Bit 2 = FPGA Configuration Error
                        Bit 3 = Synthesis Clock PLL Lock
                        Bit 4 = External Reference PLL Lock
                        "
            ::= { radSNMP_Mod_Status 4 }

radLatchedMinorAlarmStatus OBJECT-TYPE
            SYNTAX  INTEGER (0..255)
            ACCESS  read-only
            STATUS  current
            DESCRIPTION
                        "Minor Alarm latched status:
                        A bit field. 0 = PASS, 1 = FAIL
                        Bit 1 = Terrestrial clock activity detect
                        Bit 2 = Tx data activity detect
                        Bit 3 = Interleaver FIFO empty error
                        Bit 5 = Loss of frame synchronization
                        "
            ::= { radSNMP_Mod_Status 5 }

radLatchedCommonAlarmStatus OBJECT-TYPE
            SYNTAX  INTEGER (0..255)
            ACCESS  read-only
            STATUS  current
```

```
            DESCRIPTION
                    "Common Alarm latched status:
                    A bit field. 0 = PASS, 1 = FAIL
                    Bit 0 = -12V alarm.
                    Bit 1 = +12V alarm.
                    Bit 2 = +5V  alarm.
                    "
            ::= { radSNMP_Mod_Status 6 }

radRevisionNumber OBJECT-TYPE
            SYNTAX  INTEGER (0..255)
            ACCESS  read-only
            STATUS  current
            DESCRIPTION
                    "Revision number of the modem firmware with an implied decimal point.
                    For example, a value of 23 means version number 2.3"
            ::= { radSNMP_Mod_Status 7 }

radPlus5Volts OBJECT-TYPE
            SYNTAX  INTEGER (0..255)
            ACCESS  read-only
            STATUS  current
            DESCRIPTION
                    "+5V monitor with implied decimal point.
                    For example, a value of 51 represents +5.1 Volts."
            ::= { radSNMP_Mod_Status 8 }

radPlus12Volts OBJECT-TYPE
            SYNTAX  INTEGER (0..255)
            ACCESS  read-only
            STATUS  current
            DESCRIPTION
                    "+12V monitor with implied decimal point.
                    For example, a value of 119 represents +11.9 Volts."
            ::= { radSNMP_Mod_Status 9 }

radMinus12Volts OBJECT-TYPE
            SYNTAX  INTEGER (-255..0)
            ACCESS  read-only
            STATUS  current
            DESCRIPTION
                    "-12V monitor with implied decimal point.
                    For example, a value of -122 represents -12.2 Volts."
            ::= { radSNMP_Mod_Status 10 }

radTemperature OBJECT-TYPE
            SYNTAX  INTEGER (0..1000)
            ACCESS  read-only
            STATUS  current
            DESCRIPTION
                    "Temperature monitor with implied decimal point.
                    For example, a value of 490 represents 49.0 C"
            ::= { radSNMP_Mod_Status 11 }

radFactoryConfiguration OBJECT-TYPE
            SYNTAX  INTEGER (0..65535)
            ACCESS  read-only
            STATUS  optional
            DESCRIPTION
                    "A bit field that shows the factory configuration options. 0=No, 1=Yes.
                    Bit 0 = Serial Interface Present
```

```
                    Bit 1 = Parallel Interface
                    Bit 2 = ASI Norm Interface
                    Bit 3 = ASI Null Interface
                    Bit 4 = E3 Interface Present
                    Bit 5 = T3 Interface Present
                    Bit 6 = STS-1 Interface Present
                    Bit 7 = HSSI Interface Present
                    Bit 8 = DSS Option Enabled
                    Bit 9 = SNMP Option Enabled
                    Bit 10 = Parallel DVB Present
                    Bit 11 = Parallel M2P Present
                    Bit 12 = DVB LVDS Present
                    Bit 13 = OC3 Interface Present
                    Bit 14..15 = Spares
                    unsupported"
            ::= { radSNMP_Mod_Status 12 }

    radLastRateStatus  OBJECT-TYPE
            SYNTAX  INTEGER {
                    symbol(0),
                    data(1),
            }
            ACCESS  read-only
            STATUS  current
            DESCRIPTION
                    "Shows the current rate precedence. See Last Rate Control notes."
            ::= { radSNMP_Mod_Status 13 }

END
```

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Glossary

A	
A	Ampere
AC	Alternating Current
ADC	Analog to Digital Converter
AGC	Automatic Gain Control
AIS	Alarm Indication System. A signal comprised of all binary 1s.
ANSI	American National Standards Institute
ASCII	American Standard Code for Information Interchange
ASIC	Application Specific Integrated Circuit
ATE	Automatic Test Equipment
B	
BER	Bit Error Rate
BERT	Bit Error Rate Test
Bit/BIT	Binary Digit or Built-In Test
BITE	Built-In Test Equipment
bps	Bits Per Second
BPSK	Binary Phase Shift Keying
Byte	8 Binary Digits
C	
C	Celsius
CATS	Computer Aided Test Software
CA/xxxx	Cable Assembly
CD-ROM	Compact Disk – Read Only Memory
CLK	Clock
cm	Centimeter
COM	Common
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check. A system of error checking performed at the transmitting and receiving stations.
CW	Continuous Wave
C/N	Carrier to Noise Ratio

D	
DAC	Digital to Analog Converter
dB	Decibels
dBc	Decibels Referred to Carrier
dBm	Decibels Referred to 1.0 milliwatt
DC	Direct Current
DCE	Data Communications Equipment
Demod	Demodulator or Demodulated
DPLL	Digital Phase Locked Loop
DTE	Data Terminal Equipment
DVB	Digital Video Broadcast
D&I	Drop and Insert
E	
E_b/N_0	Ratio of Energy per bit to Noise Power Density in a 1 Hz Bandwidth.
EEPROM	Electrically Erasable Programmable Read Only Memory
EIA	Electronic Industries Association
EMI	Electromagnetic Interference
ESC	Engineering Service Circuits
ET	Earth Terminal
F	
F	Fahrenheit
FAS	Frame Acquisition Sync. A repeating series bits which allow acquisition of a frame.
FCC	Federal Communications Commission
FEC	Forward Error Correction
FIFO	First In, First Out
FPGA	Field Programmable Gate Arrays
FW	Firmware
G	
g	Force of Gravity
GHz	Gigahertz
GND	Ground

H	
HSSI	High Speed Serial Interface
HW	Hardware
Hz	Hertz (Unit of Frequency)
I	
IBS	Intelsat Business Services
IDR	Intermediate Data Rate
I/O	Input/Output
IEEE	International Electrical and Electronic Engineers
IESS	INTELSAT Earth Station Standards
IF	Intermediate Frequency
INTELSAT	International Telecommunication Satellite Organization
ISO	International Standards Organization
J	
J	Joule
K	
Kbps	Kilobits per Second
Kbps	Kilobytes per Second
kg	Kilogram
kHz	Kilohertz
Ksps	Kilosymbols per Second
L	
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LO	Local Oscillator

M	
mA	Milliampere
Mbps	Megabits per Second
MFAS	Multi-Frame Acquisition Sync. See FAS.
MHz	Megahertz
MIB	Management Information Base
Mod	Modulator or Modulated
ms	Millisecond
M&C	Monitor and Control
N	
NC	Normally Closed
NO	Normally Open
ns	Nanoseconds
NVRAM	Non-Volatile Random Access Memory
N/C	No Connection or Not Connected
O	
OQPSK	Offset Quadrature Phase Shift Keying
P	
PC	Personal Computer
PLL	Phase Locked Loop
ppb	Parts per Billion
ppm	Parts per Million
P/N	Part Number
Q	
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying

R	
RAM	Random Access Memory
RF	Radio Frequency
ROM	Read Only Memory
rms	Root Mean Square
RU	Rack Unit. 1 RU = 1.75”
Rx	Receive (Receiver)
RxD	Receive Data
R-S	Reed-Solomon Coding. Reed-Solomon codes are block-based error correcting codes with a wide range of applications in digital communications and storage.
S	
SEQ	Sequential
SYNC	Synchronize
T	
TBD	To Be Designed or To Be Determined
TM	Technical Manual
TPC	Turbo Product Codes
TRE	Trellis
Tx	Transmit (Transmitter)
TxD	Transmit Data
U	
UART	Universal Asynchronous Receiver/Transmitter
UUT	Unit Under Test
V	
V	Volts
VAC	Volts, Alternating Current
VCO	Voltage Controlled Oscillator
VDC	Volts, Direct Current
VIT	Viterbi Decoding

W X Y Z	
W	Watt
Misc.	
µs	Microsecond
O	Ohms
16QAM	16 Quadrature Amplitude Modulation
8PSK	8 Phase Shift Keying